RAILROAD GAZETTE

FRIDAY, MARCH 23, 1894.

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Contributions.

Rail Specifications.

Pittsburgh Testing Laboratory, Ltd.,
PITTSBURGH, Pa., March 19, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We desire to thank you for the publication in the columns of your paper last week of our new specifications for steel rails. We would, however, ask you to correct your reading of clause No. 1.

The clause of our specifications reads, "The steel for rails must be made by the Bessemer process and conform to the following standard:"—then follow the names of the different elements as follows:

Carbon	per cent to per cent.
Manganese, not over	"
Phosphorus, not over	"
Sulphur, not over	"
Silicon, not over	"

After the body of the clause you have put in brackets "Chemical analysis follows." This is misleading to readers of your paper, as it conveys the idea that we have established a standard for chemical analysis of rail steel to govern all rails we inspect. As set forth in the "*N. B.*" of specifications we establish no such standard.

PITTSBURGH TESTING LABORATORY, LTD.

Donkin & Kennedy's Boiler Trials.

BOSTON, Mass., March 12, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The communication of "Tubes" in the *Gazette* of the 9th instant relating to the boiler trials made by B. Donkin and Professor Kennedy, brings up a point of practice in England which renders boiler trials there singularly lacking in completeness. I refer to the almost universal omission of any determination of moisture in steam. Persons familiar with the marine trials carried out by Professor Kennedy and the Research Committee of the Institution of Mechanical Engineers a few years ago, and the almost useless results then obtained from the S. S. Tartar, in consequence of there having been no determination of moisture in the steam, will be surprised that in these later trials these eminent and accomplished experimenters should have omitted so important a feature. In England there appears to be complete ignorance of the throttling calorimeter, invented by Prof. L. H. Peabody, of the Massachusetts Institute of Technology, and this was plainly evident in the discussion of the marine trials, when regret was expressed at the omission of moisture determination, by the remarks of Professor Kennedy. He then referred to "that instrument," and stated that he believed it subject to an error of one per cent. Its use, however, would have saved his results from the suspicion of an error of many percentages.

In the marine trials referred to, the boiler that was most suspected of priming, was just the one that had all those qualities that are known to diminish or prevent priming.

While it is now well understood that shell boilers seldom send over as much as one per cent. of moisture even when forced, recent trials in Boston with a well-known water tube boiler when forced showed continuous moisture of fully 30 per cent., so that the calorimeter is not likely to fall out of use.

The Research Committee of the British Institution of Mechanical Engineers is now investigating calorimeters, and will doubtless make a valuable report.

There is one very interesting result of the boiler trials by Donkin and Kennedy, viz., that the best evaporation was obtained from a locomotive boiler, although that from the Lancashire boiler, including the effect of an economizer in the smoke flue was the highest stated. If the locomotive boiler had been provided with an economizer it would have far surpassed the Lancashire, as it will any other type of boiler under equal conditions.

F. W. DEAN.

The Color of Switch Lights

Feb. 17, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reading your issue of Feb. 16, to-day, as I do regularly every Saturday, I note a statement on page 127 under the heading "Switch Light Practice in Chicago," which causes me to ask you for a little further explanation. You say: "Anything which tends to abolish or restrict the use of white as a 'color' is pretty sure to be in the line of progress."

My observation has led me to a different conclusion, and I believe that the practice of the roads in "List D" is the most reasonable and the safest. I assume that everybody will grant that a white lens will show a light much further and clearer than a green lens. It must follow, therefore, that the engineman will know sooner that his track is safe if the switch lamp shows white. If it does not show white it must show red. If it shows neither white nor red the light must be out and no light means the same as a "red light."

So far, therefore, I assert that in main track work the white lens is safer than the green. There can be only one dangerous combination by using the red and white lenses on the main track. If there should be *no* light, and a white lantern should happen to be in line of the unlighted switch, there would be a serious element of danger. But is not that danger remote, and cannot fast train service be provided for better by having the strongest and clearest light for "safety"?

Again, with red and white or red and green for main track switches, should any "colors" except green and white be used for yard switches? Should not a red light be considered an order to stop wherever seen? Are not red lights in yard switches a source of great confusion to main line runners, especially where curves and unfavorable conditions of weather aid the confusion?

E. L. M.

[White is objectionable as a "color" because there are so many other lights of the same color. At many signals the engineman has to pick out the signal light from so many other lights that the added tax on his vigilance is considerable. But this is not the worst of it; the presence of enough lights to produce even a little confusion tends strongly to induce runners to take chances. The one danger which our correspondent admits is, therefore, in our opinion, not so remote as he estimates it to be. Green cannot be seen so far as white; but with large, well made lamps and suitable lenses it can be seen far enough; say a mile or two.—EDITOR RAILROAD GAZETTE.]

The Problem of Counterbalancing.

PHILADELPHIA, March 17, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It was with a great deal of pleasure that I read the paper on the "Vertical Influence of Counterbalancing," by R. A. Parke, as read before the N. Y. R. R. Club last month. The subject is one that hitherto has been greatly clothed in a mantle of guesswork and mysticism, but the solution as offered by Mr. Parke goes a long way toward bringing it in its proper dress. In the conception of the detailed plan for the solution of the problem, I think Mr. Parke to be undoubtedly correct, but in looking over his work there are a few points to which exception must be taken. In devolving eq. (4) a mathematical mistake has been made of deriving the term Sin α instead of Sin φ in the first member on the right hand side of the equation. It is remembered that α is the angle of the crank, while φ is the angle of the connecting rod, both with the axis of the cylinder. Eq. (4) ought therefore to read:

$$N = M_1 \left\{ b' d \frac{\text{Sin } \varphi \cos (\alpha - \varphi)}{\text{Cos } \varphi} + \omega'^2 d \cos (\alpha - \varphi) - \frac{b'}{l} \frac{k^2}{\text{Cos } \varphi} \text{Sin } \alpha - \frac{p'}{l} d \frac{\text{Sin } \alpha \sin \varphi}{\text{Cos } \varphi} \right\} + (M_1 + M_2) \frac{p' \cos (\alpha - \varphi)}{\text{Cos } \varphi}.$$

The effect of this upon subsequent equations is marked by a strong tendency toward simplifying the result. All the following terms for N contain the member $\left(1 + \frac{r}{l}\right)$, which member becomes changed into $2\frac{r}{l}$ and eq. (5):

$$W'''c = W_c r \frac{r^2 + k^2 - 2r^2 \frac{d}{l}}{l^2 - r^2} + W_p r \frac{r^2}{l^2 - r^2}.$$

Equations (6), (7) and (8) will all experience the same change, and equations (9) and (10) acquire the simpler forms:

$$W'''c = W_c r \frac{\frac{1}{2} l^2 - \frac{1}{4} r^2}{l^2 - r^2} + W_p r \frac{r^2}{l^2 - r^2}, \qquad (9)$$

and

$$W_{c_1} c_1 = mr \left\{ \frac{W_c (\frac{1}{2} l^2 - \frac{3}{4} r^2) + W_p (l^2 - 2r^2)}{n (l^2 - r^2)} \right\}. \qquad (10)$$

But in (9) $\frac{1}{4}r^2$ can be omitted as of no significance, thus bringing the necessary moment of counterpoise for the vertical balancing of the reciprocating parts to the simple form of:

$$W'''c = \frac{r}{l^2 - r^2} \left(\frac{1}{2} W_c l^2 + W_p r^2 \right) \qquad (9a)$$

The simplicity of this question when compared to eq. (19) in Mr. Parkes paper is obvious.

If in (10) $\frac{3}{4}r^2$ is dropped as of little comparative value, we shall have for the extra moment of counterpoise as divided among the drivers to secure the desired horizontal balancing:

$$W_{c_1} c_1 = W_{c_2} c_2 = \ldots = \frac{mr}{n (l^2 - r^2)} \left(\frac{1}{2} W_c l^2 + W_p (l^2 - 2r^2) \right). \qquad (10a)$$

The two equations in the "summary" are now represented by equations (9*a*) and (10*a*), both being different from those given under the above head. The figures and letters used in the above equations are, of course, the same as those used in Mr. Parke's paper.

In the part of the research devoted to the analysis of the path of the center of gravity of counterpoise, an assertion is made to which I can hardly acquiesce. When considering the elastic track it is supposed that the analytical translation of the formulas would mean a sudden jump in acceleration and position and character of pathway the moment there is a tendency of the wheel to lift clear of the track. This seems a mathematical incongruity. Is it not rather that the acceleration and especially the ellipitical orbits are continually changing from the moment s—the lift, or, more correctly speaking, the decrease in deflection of rail—commences to take place, and that this change simply follows the law of a rapid increase, the greater s becomes?

I agree thoroughly with the author in reference—in the discussion—to the raising of the wheel, due to the inertia of the rail, when referring to the elastic track. The effect of this, however, will simply be to make it conform more to the result of the rigid rail, having therefore no effect upon the general conclusions.

I consider the paper to be one of the most important ones read in later years in the field of engineering, and I trust Mr. Parke will please to consider whatever suggestions may be made upon his work, and that it finally in its revised form, may occupy the place it deserves namely, as a chapter in our standard mechanical text books.

H. V. LOSS.

The Classification of Compound Locomotives.

LONDON, Feb. 3, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The *Railroad Gazette* of Jan. 5 contains a rejoinder by Mr. v. Borries to our letter which you were good enough to publish Dec. 1 last, and in which we protested against the method of classification adopted by Mr. v. Borries in his paper before the Engineering Congress, where, in a table professing to represent the numbers of compound locomotives of various systems built and building, that gentleman included the total of nearly 500 engines of the Lindner system among those of his own.

Mr. v. Borries appears from his letter to claim that, under the heading of the Worsdell-v. Borries system, all those two cylinder compound locomotives should be included which start by means of live steam admitted to both cylinders and then revert automatically to compound working, and that this system is distinguished from that of Mallet only by the fact that in the latter the change to compound working takes place not automatically, but at the will of the engineer. For the sake of consistency, Mr. v. Borries would then also have to regard, as properly belonging to the Mallet system, his own most recent design (1893), which only differs from the Mallet (1886) in substituting a double piston valve for the double-seated spindle valve employed by Mallet. But since Mr. v. Borries has elsewhere approved the principle of giving the engineer the power of changing at will from compound to non-compound working, such a method of classification would result in there being only one nomenclature—that of Mallet—and this would not be at all in accordance with the undoubtedly valuable services which Mr. v. Borries has rendered in the development of the compound system for locomotives.

If the history of the development of the compound locomotive be followed from the first practically useful design of such an engine by Monsieur Mallet, it will be seen that the departure in principle which Mr. v. Borries names as distinguishing his system from that of Mallet is a very slight one, and it would be much more correct, indeed, to include all two-cylinder compound locomotives under the heading of Mallet engines, although for three-cylinder and four-cylinder locomotives this nomenclature would not be appropriate.

The starting impulse can, in those positions at which it is the low-pressure piston that has to do the starting, be obtained only by admitting live steam to the low-pressure cylinder, and the problem therefore was to suitably reduce the pressure of this auxiliary steam, while abviating any obstructive back-pressure of this steam against the high-pressure piston. This problem was solved by Messrs. Mallet and v. Borries by mean of an intercepting valve located in the receiver; whereas Lindner solved it without any obstruction of either the main steam-passages or of the receiver, while also utilizing already existing parts—a a point of difference

which surely affords a better means of distinction than the mere mode of operating a valve to fulfill the same purpose, whether by automatic action or by the hand of the engineer.

The fact that Mr. v. Borries was also working since 1880, and prior to Mr. Lindner, in the direction which the latter subsequently successfully adopted, is well known, as also that the Lindner, four-way cock, actuated by the reverse lever, is similar in its action to the slide valve, also actuated by the reverse lever, referred to by Mr. v. Borries. The effect of such cock or slide valve is, however, merely that of admitting steam when the reverse lever is full-forward or full-back, and this admission could also, without altering the system, be controlled by a valve operated by the engineer.

What Mr. v. Borries failed to discover, however, are those other two devices which are quite peculiar to Mr. Lindner's invention, and which from its essential features. These may be summarized as follows:

1. Complete balancing of the high-pressure piston at all those positions of the cranks at which the low-pressure piston has alone to do the starting. (Relief channels in the high-pressure slide valve.)

2. Limiting the admission of auxiliary steam into the low-pressure valve chest and so into the receiver, to those positions only of the cranks at which there is need for supplying such steam to the low-pressure piston. (Control of the admission port for auxiliary steam by means of the low-pressure slide valve itself.)

The Lindner device does not therefore consist, as Mr. v. Borries maintains, merely in the four-way cock actuated by the reverse lever, and the "fact" which that gentleman proceeds to conclude from this assumption is therefore also untenable.

As regards the trial on the Saxon State Railroads, to which Mr. v. Borries refers, of a valve of his most recent design with means for changing from compound to non-compound working at the will of the engineer, we are informed that the purpose of this trial,—which is being made on an engine having cylinders of somewhat too small capacity for the excessive amount of work which it is called upon to perform,—is to ascertain whether, for such a special case as that just described, the valve in question is more or less suitable than the Lindner device, as also modified to suit such special cases. Such comparisons can only be judged by their results, and it was as the result of practical tests such as these that, in the case of the former v. Borries valves, they were superseded on the Saxon State and other railroads by the Lindner system.

We do not feel called upon to enter into the more personal portion of Mr. v. Borries' letter to the *Railroad Gazette*.

HOPE & CO.

Vestibules, Platform Canopies and Hoods.

(*Concluded from page 173.*)

The Pullman Palace Car Company has made further improvements in the design of vestibules and has introduced what is termed the improved extended vestibule which incloses and utilizes the whole of the platform of a car. This vestibule is shown in figs. 25, 26 and 27. It is provided with the same equalizing devices above and below and employs the same frictional resistance to prevent lateral oscillation as the earlier type. The essential features of the vestibule connection are the same, and the improvements are chiefly confined to the platform inclosure. The introduction of windows at the end of the car is one of the features of this construction which permits of better ventilation. The platform may be utilized by the trainmen, or even by passengers, and the steps are covered with drop doors so that the entire area of the platform is available. This construction, too, enables the company to use a single door (7) at the sides and avoids the double folding doors of the other pattern. Except as a matter of convenience and economy in floor space the vestibule presents no special features. It is the style used on the train exhibited by the Pullman Company at the World's Fair.

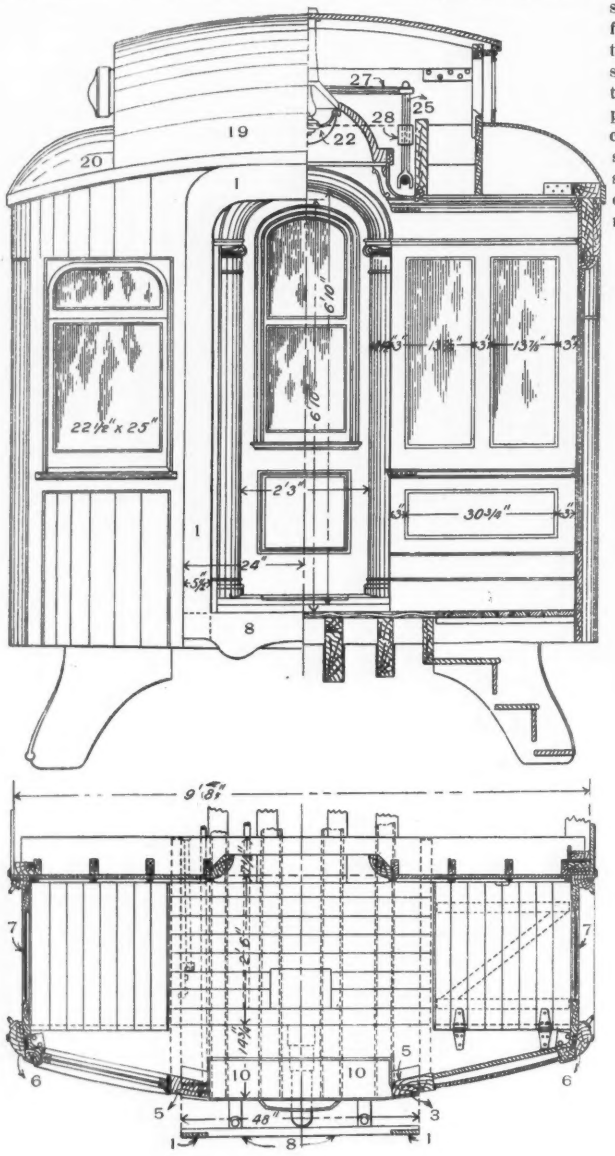


Fig. 25.

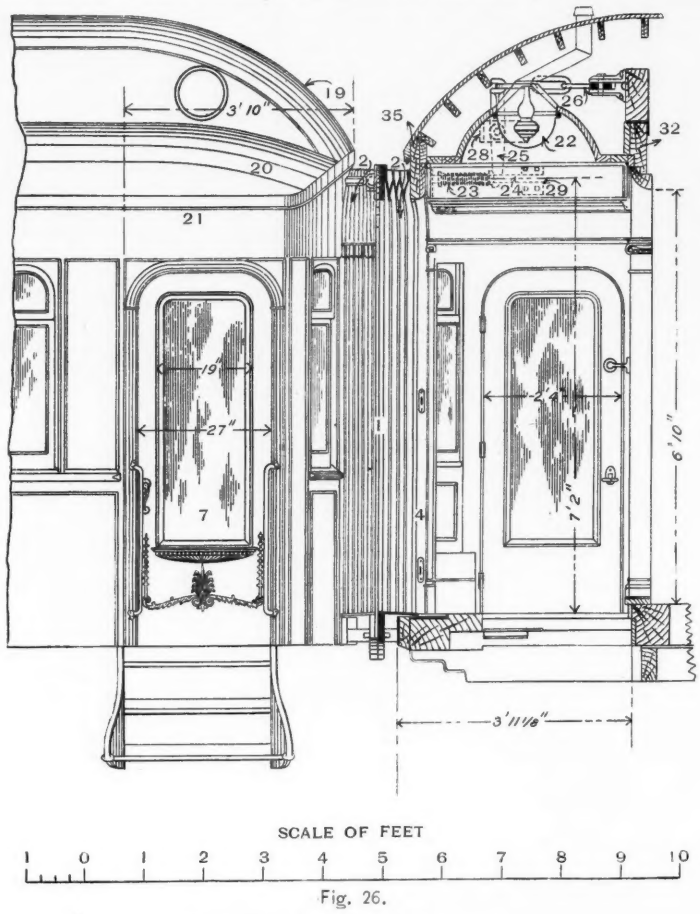


Fig. 26.

Pullman Improved Extended Vestibule.

The platform attachments, hand-brake wheels, etc., are shown in fig. 28, and the external appearance when two cars are coupled in fig. 27.

A brief survey of the functions performed by the types described may be appropriate, not for the purpose of comparing vestibules, but to discuss the advantages of certain features. First, there is little doubt that the feature of the vestibule that impresses the public with most favor is the covered passageway, and the feelings of comfort and security it conveys. These feelings are due not only to the exclusion of dust and cinders, the prevention of accidents to passengers, especially women and children, in passing from one car to another, and the protection from draughts of cold air, but also from the strong, solid and compact appearance it gives to a train. These features, together with the attractive and elaborate decorations, make vestibules popular with the traveling public. That the other functions play any part in the choice of trains with the masses may well be doubted.

With railroad officers there can be no doubt that the vestibule does mitigate the destructive effects of collisions that it prevents telescoping and that it saves some racking of the roof and sides of the cars.

The vestibule perhaps diminishes the atmospheric resistance of a train, in a measure. In fact, this was the sole object of Sir Henry Bessemer's canopy.

The advantages of one type over another to make and maintain a covered passageway are not great. The Pullman vestibule is the only one to employ a transverse equalizer for the face plate, and it has one above in the hood and one below, underneath the platform These are self-adjusting, under spring pressure, and are intended to keep the face plates in close contact, on curves and irregular track, to keep out smoke and cinders and to always insure frictional resistance under spring pressure. The equalizer yoke between the buffer and drawbar helps to maintain the same condition The means of securing and maintaining a tightly inclosed platform are equally available to all, except that the Pullman company claims the exclusive privilege to use spring pressure to keep the face plates together.

The Pullman extended and the Barr wing vestibule afford an end window for ventilation through the vestibule, but the great advantage of this over a window in the end of a car, well screened, is not apparent, except the unsightliness of the screen which is partly hidden from view in the Barr and Pullman.

The security afforded by a vestibule itself in a collision is an important element. It no doubt assists in preventing the piling up of cars and materially lessens the danger of telescoping, but the resistance that it affords to the inertia of other cars cannot be great, for the superstructure of cars is not constructed to transmit or resist shocks due to collision. The sides above the windows are not built to transmit compression to the underframing and so to other cars. The compression that a vestibule would transmit from one car to another would depend upon the framing of the end post or inner face plate to the end of the car. The composite framing of the Wagner and allied companies seems well calculated to strengthen the vestibule and to resist shocks. The vestibule plates are framed to it by heavy wrought iron bars and bolts, giving great strength. All three vestibules are probably framed as heavily as the frail roof and sides will warrant, and if not, there is no reason why they should not be. The shock of collision must be resisted chiefly by the underframing; to which it is transmitted by the buffing devices, platform and end-sill trussing. Numerous devices have been employed to convey the shock of collision to the sills, one of the earliest being the Cowell platform. Those prominently in use to-day are the Gould buffer and platform and the Pullman anti-telescoping device. In both the platforms are greatly strengthened, and the end-sills are plated and stiffened with shapes and plates.

Probably the patent composite end framing of the Wagner cars, which is carried out in the Gould vestibule, affords the greatest strength to the superstructure. The fact that spring pressure is used in all modern buffing devices is pretty good evidence of its superiority, and it will probably not be disputed that the Pullman company has the best device for resisting shocks to their superstructure in collisions. The other vestibules do not employ spring pressure, between the superstructure and the face plate, and any attempt to do so would probably provoke an injunction suit by the Pullman company under the Sessions patent.

The part that a vestibule plays in preventing or diminishing lateral motion or oscillation is still not very well determined, although it is a feature that was thought very much of in the early days of the modern vestibule,

and in the patent suits before mentioned it was proved to the satisfaction of the court that it was a very important and very valuable feature of the vestibule. Many contend that its value lies more in theory than in practice, and that there is no advantage in having a rigid face plate to resist lateral and vertical motion.

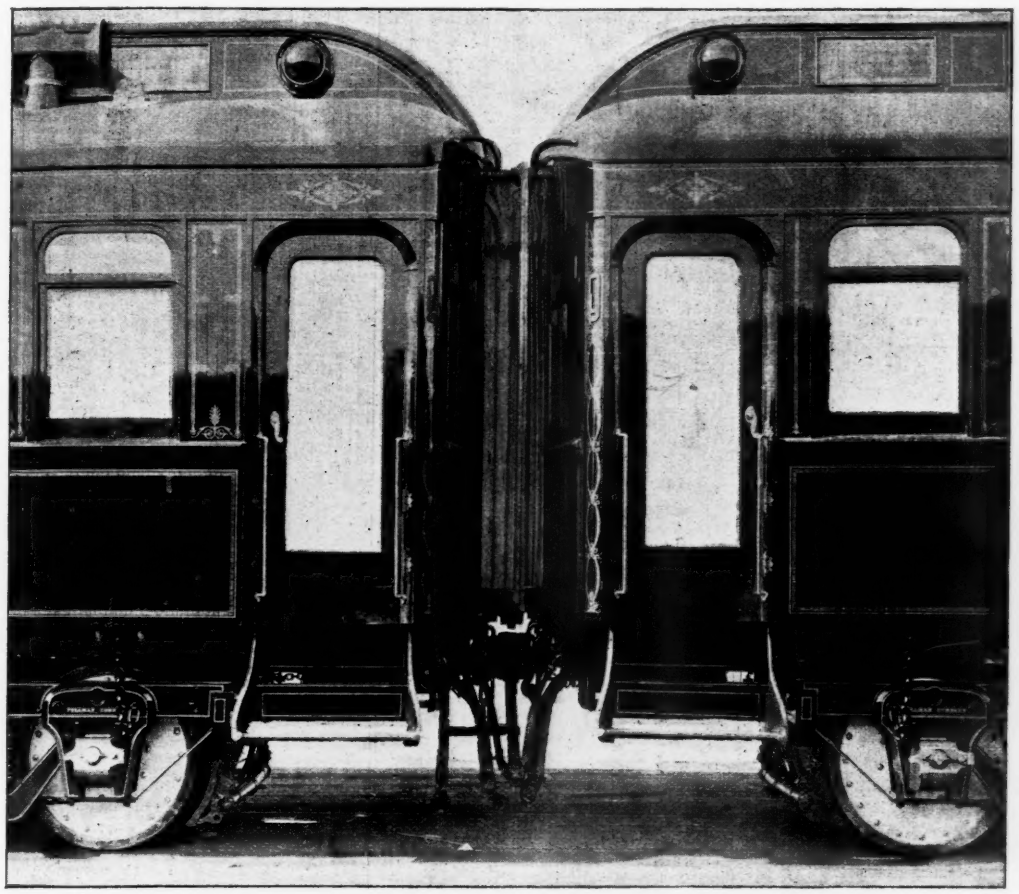


Fig. 27—Pullman Improved Extended Vestibule.

Whether these are the outgrowth of trade competition or of the conscientious judgment of fair-minded railroad men is not our office to determine. We know of no tests that have been made to prove conclusively that it does greatly diminish oscillations, but the theoretical deductions are in its favor.

An item of considerable significance and importance in the adoption of the vestibule feature for a train is its cost. There is little choice in the prices quoted by the several manufacturers, though there must be a great difference in the original cost of production, as a short study of the drawings will show. In general it may be said that a vestibule increases the cost of a new car by about $1,000. By inviting bids, close bargaining and economical practices this price may be reduced 30 per cent. It would not be safe to estimate the additional cost of the vestibule feature in general without specification as to the type, at less than for $700 to $800 per car, for first-class materials and work to a first class car; these are low figures. The essential parts of a vestibule f. o. b. at the manufacturer's shops have been quoted as low as $450 for the Pullman (old type), $300 for the Barr and $300 for the Gould, but the items included for the price should be carefully scheduled. We say this because some roads have found it necessary to provide, in addition to the parts bought, nearly a ton of forgings, over $300 worth of brasswork, nearly $100 for vestibule dome lamps, 20 odd dollars for glazing and $150 for labor, lumber, paint, etc., thereby increasing the cost to nearly $1,000. The platform, buffers and draw gear are not included, for which about $100 should be added. Then, if the feature is to be applied to an ordinary standard coach, the platforms must be strengthened, in order that it shall safely sustain the great weight of the vestibule, supported upon the extreme end of the platform; for this $50 to $100 should be added. These additional items will bring the expense to about $1,200; after which the purchasing agent will be given a chance to elect whether he will have iron or brass hand-rails, brake-wheels, etc., at $75 per car extra, whether the steps shall be bound in brass at $25, and numerous other furnishings at $5 each, until the cost of the $700 vestibule has reached $1,500 or more. The fact that the essential parts of a vestibule can be bought for $250, or $300, or $450, is no certain criterion of how much the vestibule will cost complete.

If a car is built by contract and a price agreed upon when the job is let, car manufacturers may be induced to do the construction work necessary to add the vestibule feature at a very low figure, varying from $150 to $250. If the draft rigging, platform and buffing devices of the road are the same as that employed with the vestibule, and the platform and draw timbers are strong enough, and the hand rails, brake wheels and other parts are appropriate, the prices of them may of course be omitted, which will reduce the cost to from $700 and $1,000. The price of the Pullman company for its vestibule has been $1,000, but it is believed that on construction in their own shops that this price may be shaded. The Drexel Railway Supply Company, which builds the Barr vestibule has estimated the cost when applied to new cars complete and ready for service as low as $550, but the decorations were not specified, nor is the matter of draft rigging and platform timbers mentioned. The cost of the Gould pendulum vestibule is a little more than the Barr, the prices quoted for the essential parts about the same.

Few persons have any idea of what it costs to cater to the public whims and fancies and there is no part of the car that better illustrates this wasteful expenditure of money than the vestibule, and a large part of the public would much more appreciate having all trains vestibuled in a plain, substantial and comfortable manner than having a few vestibuled in such elaborate style. If railroad companies would take the $1,500 which it costs to add the decorated vestibule to a car and apply the vestibule to the two cars at $700 there would be less likelihood of accidents. Every suburban local train should have its cars vestibuled at least to the extent of adding the framework and vestibule face plate to avoid telescoping and crushing of cars in collisions. Doors need not be added if they interfere with rapid loading of cars. Probably the time is not far distant when the telescope framework will be added not only to all passenger, baggage and express coaches, but also to the locomotive. Every tendency would seem to bear out this prediction.

NAMES OF PARTS OF VESTIBULES.

1. Diaphragm Face Plate.
2. Diaphragm, or Outer Wing (Barr).
3. Inner Wings (Barr).
4. Inner Face Plate, or Middle Post for Vestibule.
5. End Post, or Door Jamb (P. P. C.)
6. Corner Post.
7. Vestibule Door.
8. Face Plate Buffers, or Vestibule Buffer (P. P. C.).
9. Platform Buffer or Main Center Buffer (Barr).
10. Platform Foot Plate or Threshold Plate (45 in Gould).
11. Vestibule End Windows.
12. Door Guard Rod.
13. Angle Plate (Barr).
14. Uncoupling Lever, or Mast.
15. Hand Brake Mast and Wheel.
16. Brake Mast Gear Wheels, or Sheave (Gould).
17. Brake Chain Guide Casting.
18. Vestibule Gate Pockets (Pullman).
19. Vestibule Hood.
20. Platform Hood.
21. Letter Board.
22. Vestibule Dome Lamp.
23. Overhead Equalizer Spring.
24. Face Plate Piston.
25. Vertical Equalizing Lever.
26. Equalizer Connecting Chain (P. P. C.) or Face Plate Retaining Chain (Gould).
27. Horizontal Equalizing Lever.
28. Vertical Lever Clevis (P. P. C.).
28a. Back Gravity Bar (Gould).
29. Face Plate Piston Guide.
30. Toggle Joint and Bar (Barr).
32. Body End Plate.
33. Platform End-Sill (35 in Gould).
34. Buhoup Vestibule Equalizer.
35. Vestibule end Carline.
36. Chain Sheave Bracket (Gould).
37. Chain Sheave (Gould).
38. Top Face Plate Guide.
40. Gravity Bar Fulcrum Bolt (Gould).
41. Front Face Plate Gravity Bar.
42. Roller for Top of Front Gravity Bar.
43. Bottom Face Plate Guide.
44. Roller Thimble, Front Gravity Bar.
45. Drawbar and Coupler (P. P. C.) or Threshold Plate (Gould).
46. Drawbar Spring (P. P. C.).
47. Drawbar Stirrup (P. P. C.).
48. Combination Yoke (P. P. C.).
49. Drawbar Horns (P. P. C.).
50. Buffer Springs (P. P. C.).
51. Equalizer.
52. Buffer Stem.
53. Bracket for Brake Gear.
54. Bracket for Step Sides.

A Difficult Piece of Construction in London.

An interesting piece of railroad engineering work has just been done on the Great Northern main line at Holloway, London, under circumstances which illustrate the difficulties of providing accommodation for terminals in the metropolis. The Great Northern is laboring under special difficulties in this respect, because its terminus at King's Cross is confined on all sides by important thoroughfares and buildings, and therefore, unlike the Great Eastern station at Liverpool street, for instance, it does not admit of expansion to meet the growing needs of the traffic. This has increased so rapidly of late years that two new platforms have had to be added for the reception and dispatch of main-line trains, and these have absorbed space which was formerly devoted to the storage and cleaning of empty coaches. Consequently it became necessary to find room for these operations elsewhere, but as the line from King's Cross to the next station, Holloway, is carried almost entirely through tunnels, no vacant ground could be found nearer than the latter place, which is about a mile from the terminus. Here, however, a suitable area has been easily made available on the down side of the main line for the reception and storage of the empty coaches, which are to be run to it by an extra down line recently laid through the newest of the intervening tunnels.

So far all was easy, but now the problem arose how the carriages, after being cleaned, were to be got back to the terminus, for between the siding area and the up line by which they must return were eight tracks devoted to fast and slow passenger, goods and coal services, upon which the traffic is so busy that in the whole 24 hours of each day there is only one free time of a quarter of an hour—viz., between 1:15 and 1:30 a. m.—when anything could pass across without interruption.

It was clear that nothing could be done on the surface, and it became necessary to construct a passage

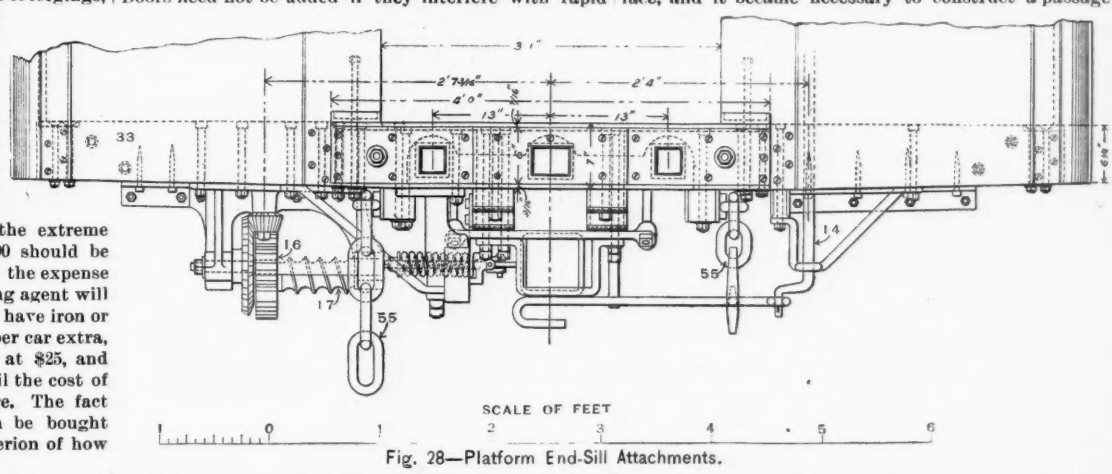


Fig. 28—Platform End-Sill Attachments.

under the eight main lines under circumstances which have no actual parallel. About a quarter of a mile from the siding area in the direction of Finsbury Park junction the down line of the North London connection which joins the Great Northern at this station dives

under the latter. It seemed convenient, therefore, to make the new subterranean passage at the same point, especially as the distance from the siding area was sufficient to allow of a connecting line to the level of the proposed subway being laid on an easy gradient. The problem, however, was to make the new passage without interrupting the running of the trains overhead.

The first step was to temporarily secure the eight tracks by putting under them timbers 40 ft. long and 16 in. square. These formed a roofing, and two trenches were excavated underneath. One of these was dug parallel to the abutment wall of the existing North London subway, which was next strengthened, while at the same time in the other trench the outside wall for the new tunnel was built.

The abutments being thus prepared the next step was to place the girders. For the eight main roads this was comparatively easy, because the bridge could be put together in eight sections, which were put into place one at a time on succeeding Sundays, when for some trains each road in turn was kept free from traffic and handed over to the engineers. But the *crux* of the undertaking was a shunting ground with numerous points and crossings, which lies on the east side of the area under which the subway has been constructed. The portion of the bridge supporting this is 105 ft. long and 26 ft. wide with end girders on the skew, 60 ft. in span; and owing to the exigencies of the traffic this had to be put in place in one piece within the hours of a single Sunday. To effect this difficult operation a staging of piles was erected at the side of the railway embankment, on which the whole main portion of the bridge was riveted up and completed. On each side of the staging was laid a double line of rails, and on each of them was made up a train of four six-wheeled trolleys, kept at distances of 35 ft. apart by horizontal struts of timber. Each of these trolleys was fitted with two hydraulic presses, the rams of which were raised up to such a point that the under side of the two lateral girders of the bridge, as they rested upon the rams, would be a few inches above the tops of the two abutment walls, which were ultimately to carry this portion of the bridge. When all was completed, three crab-winches were attached to the ropes and pulleys, and worked by four men each. Meanwhile the rails and crossings were pulled up, and the ground dug out for about 3 ft. in depth. Thus a way was cleared for the bridge—which is a flat box-girder construction, about 2 ft. thick and weighing 200 tons—to be moved slowly forward. When it had been brought above its final position the hydraulic rams were lowered until the steel structure rested firmly and permanently on the two subterranean abutments. The train of trolleys was then drawn back to the timber staging to be dismantled and removed.

It now only remained to remove the dumpling of earth between the trenches before the subway was complete. In both the structural arrangements and the moving of the bridge into place, the intricacy of the skew form was intensified by its being also on the curve; but, notwithstanding this, the design and execution had been so accurate that the massive structure was brought without any adjustment into fit with the contiguous lines of railroad. C. H. G.

Old English Locomotives.

We publish herewith an interesting scrap of English locomotive history in the shape of a half-dozen engravings of photographs furnished us by Mr. F. Moore, a London photographer, who makes a specialty of such pictures as these and who is an extensive dealer in them.

Fig. 1 is one of the earliest engines built at the now famous Crewe works, and was designed by Mr. Alexander Allan, who was manager of locomotive works before the London & Northwestern was formed out of the several smaller roads which went to make up the system. He took charge of the Crewe works in 1843 as superintendent, and this engine was built about that time. It has driving wheels 5 ft. in diameter and the cylinders are 15 in. × 20 in. Engines of this class originally had tenders, but were subsequently converted into tank engines, and some of them were in service quite recently, and we believe are running now, drawing light passenger trains.

Fig. 2 is an express engine of the Great Western, of the same general type as the Lord of the Isles, which was shown at the World's Fair last year. This type of engine was designed by Sir Daniel Gooch, who was Locomotive Superintendent of the Great Western, and Mr. I. K Brunel, the "father of the broad gage." The first of these engines was built in 1846, and some of them were in regular service up to the time the broad gage was abolished, early in 1892. The driving wheels of this engine were 8 ft. in diameter, and they had no flanges. The 7-ft. gage engines, with fireboxes 6 ft. wide, are celebrated as having made about 75 miles an hour as early as 1848. Their cylinders are 18 in. × 24 in.

Fig. 3, the "Cornwall," is an express engine of the London & Northwestern, designed by Mr. Francis Trevithick in 1847. Mr. Trevithick, son of the celebrated Richard Trevithick, was Chief Mechanical Engineer when Mr. Allan was Superintendent at Crewe. This engine is still running and has the largest driving wheels now in use, their diameter being 8 ft. 6 in. The cylinders are 17½ in. × 24 in. This engine was originally built with the boiler below the driving axle, and in that shape was exhibited at the London exhibition of 1851.

In fig. 7 we present a drawing showing the engine as it then appeared. In this shape the engine was run at 79 miles an hour. A longitudinal section of the engine, with the boiler below the axle, is shown in Colburn's Locomotive Engineering. In the drawing presented herewith the outlines of the boiler are shown by a dotted line. The new boiler, above the axle, was put in about 1862 by Mr. John Ramsbottom, then Chief Mechanical Superintendent of the London & Northwestern.

Fig. 4 represents a tank engine with 9 ft. drivers, built for the Bristol & Exeter in 1853. This photograph was taken from a drawing; but the general appearance of the engine is correctly shown. The Bristol & Exeter which is now a part of the Great Western, was 7 ft gage, and these engines continued in service until May, 1892, when the broad gage was abolished. The driving-wheels were the largest ever used in every-day service. The cylinders were 16½ in. × 24 in. These engines were designed by Mr. Pierson in 1853. They have often run at a speed of 81 miles an hour. The two pairs of wheels in front are arranged in a truck, and the two pairs at the rear in the same manner.

Fig. 5 shows another engine of the Bristol & Exeter It is similar to that shown in fig. 4, except that the driving wheels have been replaced by a pair only 8 ft. in diameter, and a tender substituted for the small tank on the back end of the frame. All the engines of this class were thus changed about 1876.

Fig. 6 is one of the few examples of an English engine with a bar frame. It is one of a class designed by Mr. Edward Bury, who was early a locomotive builder in Liverpool, and who afterward became Locomotive Superintendent of the London & Birmingham. This engine, belonging to the Furness Railway, was built, according to the plate on its side, by William Fairbairn & Sons, of Manchester, in 1858. The circular firebox with a dome top, is characteristic of the Bury type

The address of Photographer Moore is 9 South Place Finsbury, London, E. C.

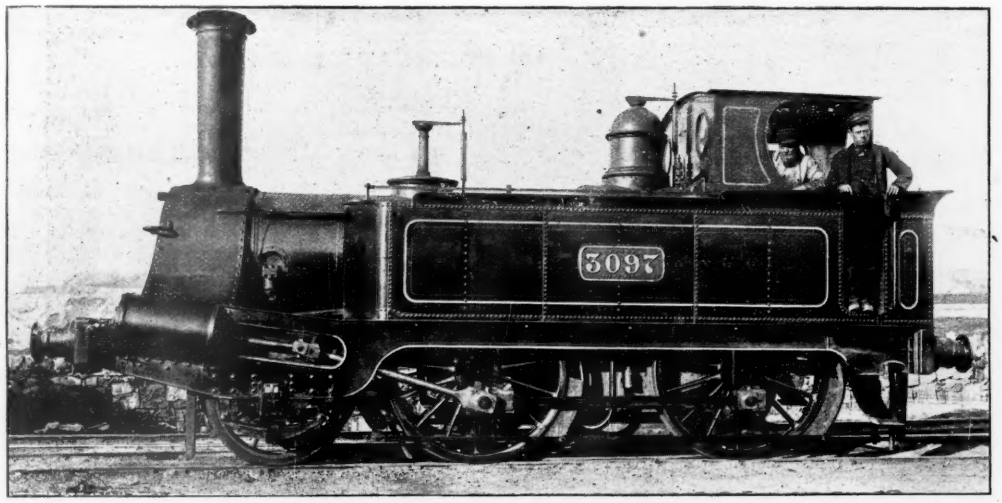


Fig. 1—London & North Western Engine, Built in 1843.

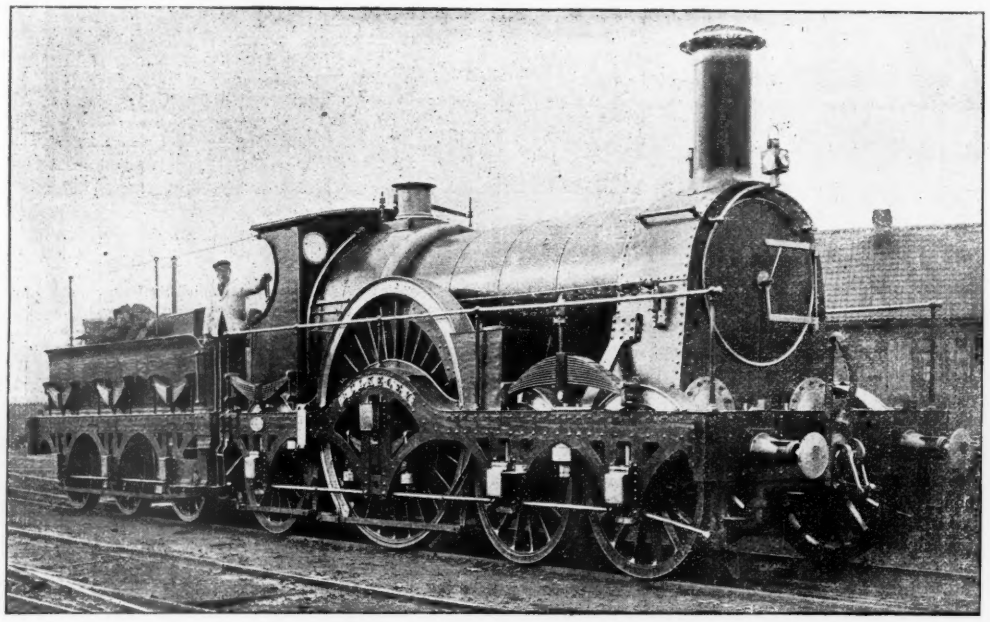


Fig. 2—Great Western (England) Engine, Built about 1846.

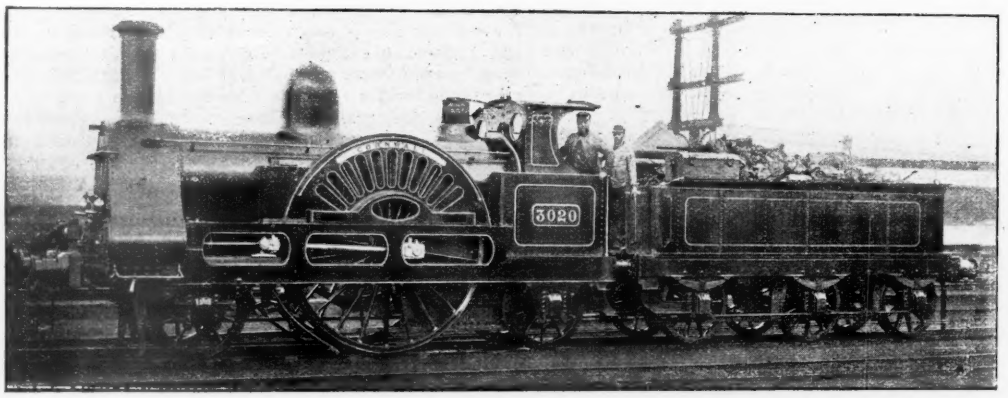


Fig. 3—London & North Western Engine, 8 1-2 ft. Driving Wheels.

Some World's Fair Figures.

	Year.	Area occupied, acres.	Roofed, acres.	Visitors millions.
Paris	1855	35	29.4	5.2
Vienna	1873	.....	75.8	7.3
Philadelphia	1876	288.56	123.7	10.0
Paris	1878	154.00	60.75	16.2
Paris	1889	241.00	131.00	32.4
Chicago	1893	674.32	258.2	27.0

A Railroad Connecting the Shores of the Arctic with St. Petersburg.*

BY O. W. MADDAUS.

With us in America the great importance of a complete system of railroads, intersecting the vast territory of the United States in all directions, has been recognized by far-sighted capitalists since the time of the elder Cornelius Vanderbilt. The demonstrations in America of what is possible with a strong will, assisted by perseverance and industry, has given our neighbor across the Pacific, the Russians, no little part of the impulse which causes them to push on vigorously the construction of the great trans-Siberian railroad; and now they are agitating the project of building a line to the extreme north of European Russia, making available the untold wealth of the soils of the country north of the St. Petersburg parallel.

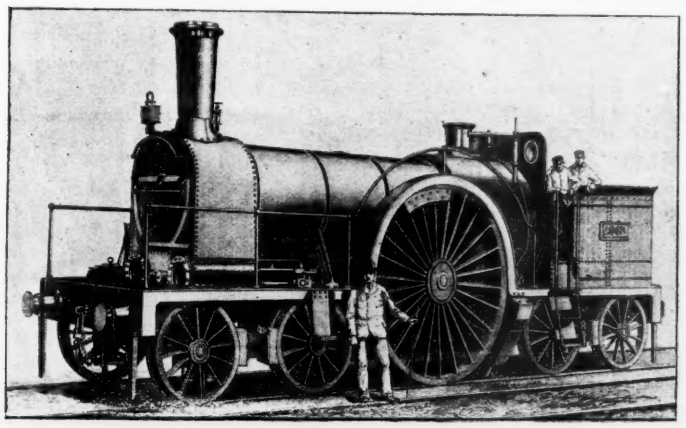


Fig. 4—Bristol & Exeter Engine, Built in 1853—9 Ft. Driving Wheel.

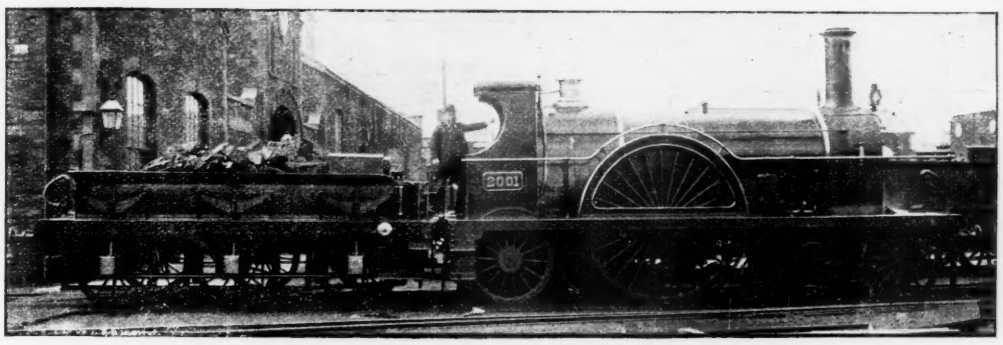


Fig. 5—Bristol & Exeter Engine—8 Ft. Driving Wheels.

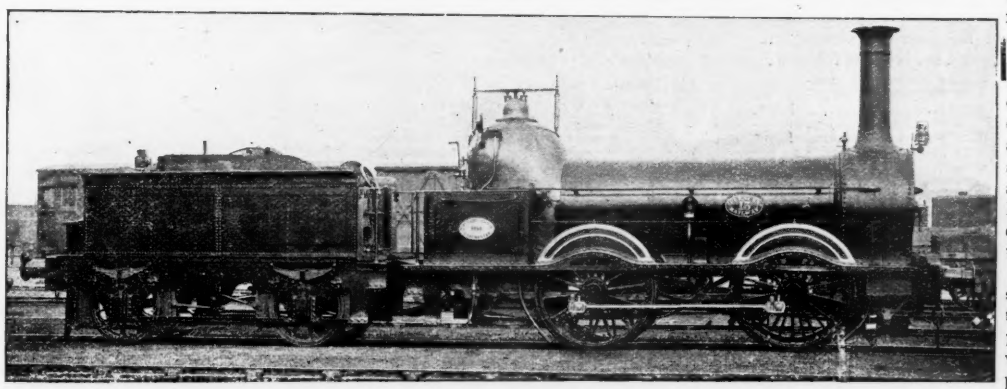


Fig. 6—English Engine with Bar Frame.

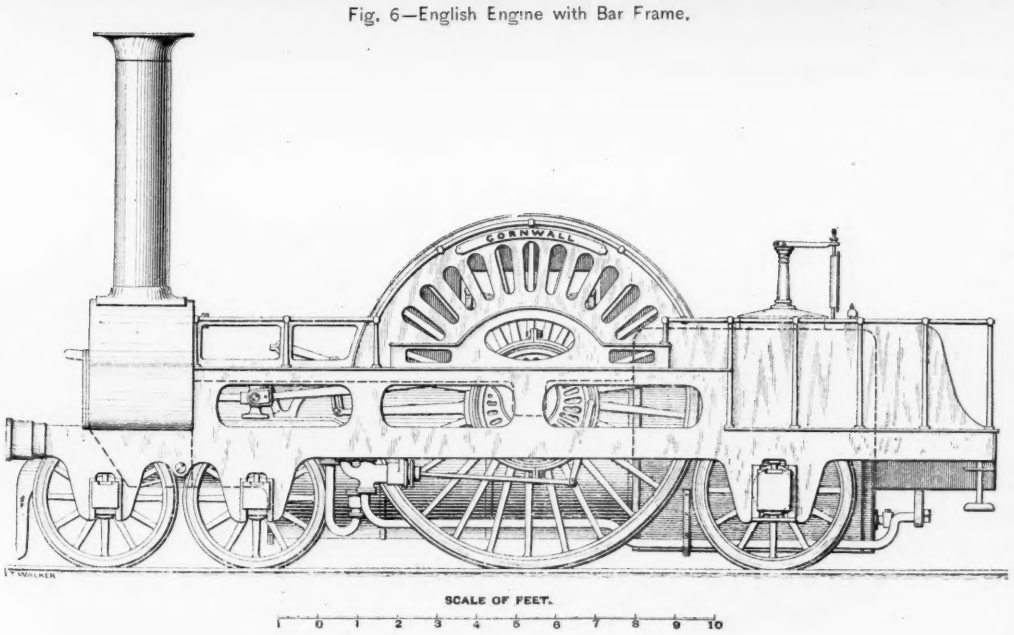


Fig. 7—The "Cornwall" in 1851.

This line is projected to connect St. Petersburg with Archangelsk, on the White Sea, the present outlet of the products of a region comprising the governments (states) of Olonets, Vologda, Viatka, part of Perm and Archangelsk, containing 633,000 square miles (over 12 times the size of the State of New York).

The gradual decrease in bulk and value of the trade of St. Petersburg and the decay of that city as a terminal and port of collection of the products of the interior, has touched the commercial interests of this brilliant City of Palaces to the marrow, and it is seen that it is of imperative necessity that something should be done to give St. Petersburg again the prestige as a commercial center which it has enjoyed from the time of its foundation, and without which its significance and splendor as the imperial residence cannot be maintained.

The pre-eminence of St. Petersburg as the residence of the rulers of all the Russias has long excited the envy of the ancient capital, Moscow, and strong pressure has been brought to bear on the government to exact privileges in tariff reductions on all railroads leading to Moscow and thence to the convenient parts on the Baltic, and as it cannot be denied that Moscow is the center of all trade south and east of it (including Siberia and the trans-Caucasian states of Russia), comprising a territory much larger than the United States and Alaska combined, though not as productive—and with the great annual market at Nishni Novgorod at its doors—it may well be conceived that St. Petersburg, situated in a remote corner of the formerly Swedish lake (the Baltic Ocean), has to keep up a hard fight with Moscow. Moscow is alert and watchful and always prepared to foil, if possible, any project which may wrench from her the dominating position as the commercial center of Russia; therefore strenuous attempts are now being made to bring the St. Petersburg Archangelsk line to Vologda, on the Sooxana (the largest tributary of the Dveena), thus diverting the bulk of the traffic from the great back country comprising the above named five states, and leaving to St. Petersburg nothing but the local trade. Vologda is making great efforts to get the connection and is backed by her powerful ally Moscow. At the same time Kasan, on the Volga, is clamoring for a railroad tapping these northern states, and in this project is also backed by Moscow. This line would cross the Sooxana at Veleeky Oostjug, passing either through Vjatka or Koteljnik. It is likely that all the projected lines will be built, but St. Petersburg will be considered first.

The following official figures tend to show the need of the St. Petersburg-Archangelsk railroad, and indicate the effect the enterprise would have as a carrier on the region affected.

In the fiscal year 1891-92 110,000 tons of smoked, dried and salt fish and tallow and hides were shipped from the northern shores of European Russia round the North Cape to St. Petersburg, a vessel only making one round trip in a year. Only 1,500 tons were brought to St. Petersburg overland from the same region. Total, 111,500 tons.

In the fiscal year 1892-93 $1,218,000 worth of timber was exported via North Cape, and $1,521,000 worth of miscellaneous products, a total of $2,739,000. This commerce would rapidly increase in importance, value and bulk if a railroad tapped the interior of the territory. Thus far there is commerce only in the coast regions and on the lower Petshora and Dveena rivers, where some of the great tracts of woodland reach to the water. The interior, with its vast wealth above and below ground, is in its virgin condition as yet, not even keeping the scant population in sufficient supply of grain, though it is capable of producing enough to amply support a dense population. The great forests, almost entirely public domains, harbor game and fur animals innumerable. The oil deposits of the upper Petshora cover an area of 230 square miles, completely eclipsing the world-renowned oil region of Baku, on the Caspian Sea, both in extent and quality.

In minerals, rich copper and iron ores crop out on the surface in great quantities; the Murman shores east of the near Norwegian border abound in pyrites of sulphur, while enough color minerals are in sight to provide not only Russia but all Europe with material for paint. Precious metals are likely to be met with. Coal abounds and awaits mining, but is of little importance while wood fuel is within easy reach everywhere. The annual and regular river inundations of the lower river meadows produce great crops of fine grass for large herds of cattle and food for St. Petersburg's 100,000 horses.

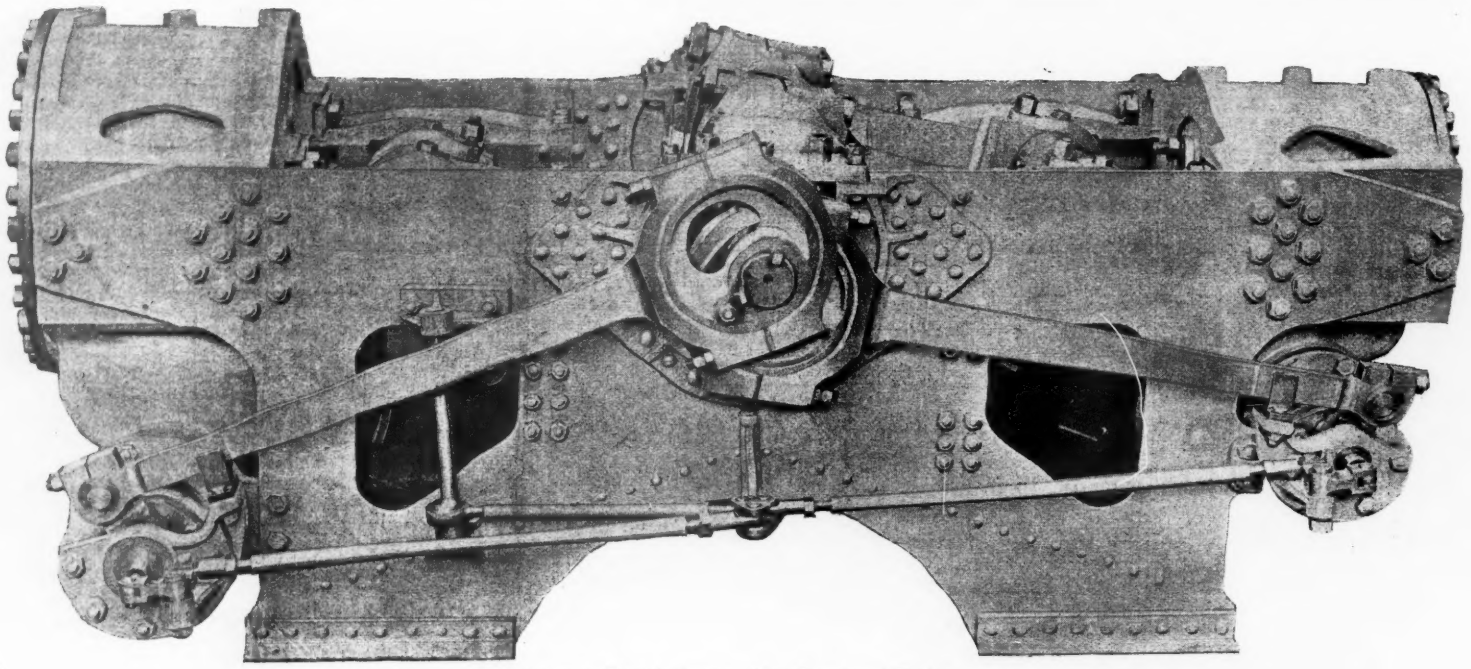
The projected railroad would follow the short Neeva up to the Ladago Lake, then crossing along the line of the Svir River to the Onego Lake, skirting the southern shores of this till it reaches the town of Veetegra, thence taking a northerly direction across the country to Cholmogary, and then follow the river Dveena to the terminal, Archangelsk. The whole route from St. Petersburg to Archangelsk, almost a bee line, is 540 miles long. With this railroad as a carrier the three great cataracts, Keevatsh, Por Porog and Girvas Porog, would be utilized as we utilize the powers of Niagara.

*Translated and edited from reports of N. W. Latkin of the Imperial Society for National Economy; W. Rudnitzky, Civil and Mining Engineer of the Russian Government, and A. P. Engelhardt, Governor of Archangelsk.

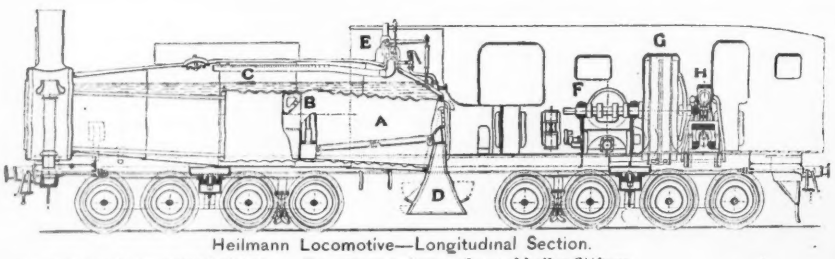
Records of Hall Automatic Block Signals.

One of the most practical questions in comparing an automatic with a non-automatic block system is that of convenience in operation. The question of safety, which always engages first attention, can be largely settled by well-known laws, and it may be that the fine points on which men disagree and which have to do with that part of this question which can be settled only after years of experience, will always remain in dispute; but the amount of delay or trouble experienced day by day is always a point of immediate interest, for the fear that a signal without an attendant may cause annoying blockades when it gets out of order is what leads some managers to favor the man-operated system, costing $1,000 or $1,500 a year for each block, instead of an automatic system costing less than one-fifth as much. We have therefore asked several important railroads to give us the records of their automatic signals, and the replies of two that have answered are given below.

The Illinois Central uses the Hall block signals on its

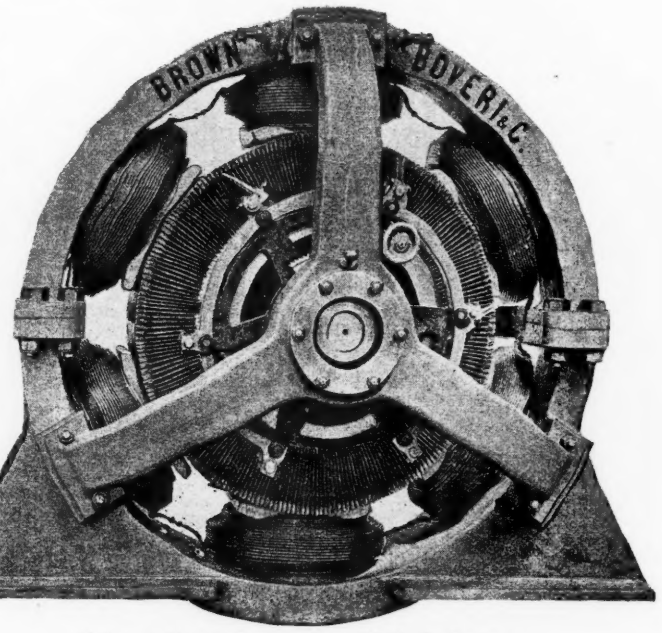


Heilmann Electric Locomotive—Compound Engine.



Heilmann Locomotive—Longitudinal Section.

A = firebox, of corrugated plates.
B = brick arch.
C = steam space and collecting pipe
D = ash-hopper, with dampers for regulating draft below fire.
E = steam valves and usual boiler fittings.
F = main steam engine, horizontal compound.
G = dynamo, armature shaft coupled direct to crankshaft.
H = small vertical steam engine driving direct small dynamo generator for exciting the field magnet coils of *G*.



Heilmann Electric Locomotive—600 H. P. Dynamo.

Chicago terminals. Four-fifths of them are worked by rail circuits, and they extend as far as Kensington, 14 miles. There are eight tracks part of the way and four or more all the way. For the suburban service (tracks 1 and 2) the signals are located, generally, on single posts 300 ft. in advance of the stations, permitting the trains to stop at the platform, where they remain should the signal be against them, thus precluding the necessity of an extra stop, as would be the case had the signals been located without reference to the stations. The blocks for these tracks are 2,800 ft. in length, including overlap, and the trains upon reaching the danger signal are permitted to proceed cautiously after one-minute interval, should the signal not clear before that time.

In all cases the signals for the other tracks are placed on overhead bridges, especially provided for that purpose, the blocks being 5,400 ft. long, including overlap. Trains on these tracks finding a signal at danger are permitted to proceed cautiously after a stop of two minutes, should the signal not clear before that time. All switches, except at interlocked points, are connected with the block system; a switch when open will block the signals on the track or tracks, the movements on which would conflict with the open switch. Switches thus controlled are equipped with indicators which warn persons desiring to use them of the approaching train, indication being given as the train passes the signal for the block on which the signal is located, or when passing the signal of the previous block.

The officer who sends us this report says:

"There is perhaps no section of railroad in this country protected by an electrically controlled block system where the traffic is so complicated or of such magnitude as that on this line between Van Buren street and Kensington, and it may be safely said that, during the six months of the Columbian Exposition, when our train service was so unprecedentedly heavy, without the block system we could not have handled our traffic successfully.

"At the present time we have an average daily signal movement as follows:

Regular suburban service	6,284
Special suburban service	2,156
Through passenger	1,980
Freights, transfers, etc	2,480
Total	12,900

Or a total number per month of 387,000 signal movements. With this total our average number of stops per month, for causes other than trains in block or open switch, is nine, which includes everything, such as battery failure, grounded track or broken apparatus, or one stop for every 43,000 signal movements.

"During the period of the Fair, when our trains were more numerous, the signal movements were correspondingly increased; but as our signals were not all in service until July the record of but four months of that period is given, as follows:

Regular suburban service, daily signal movement	9,142
World's Fair service, daily signal movement.	4,840
Through and extra passenger, daily signal movement	2,840
Freights, transfers, etc., daily signal movement.	2,635
Or a total of	20,457

This equals for a month a total of 613,710, and 2,454,840 for the four months commencing July. The number of stops reported during this time as due to other causes than trains in block or open switch was approximately 1 in 52,530 signal movements.

"These records have been carefully kept and are believed to show the actual number of unnecessary stops."

The Kansas City, Fort Scott & Memphis has used the Hall automatic signals, with the Wilson arrangement of circuits, holding the signals normally at danger, for over a year. The Chief Engineer, in sending us this record, says that "all the delays have been short and the causes readily detected and corrected."

HALL SIGNALS IN KANSAS CITY YARD (22 SIGNALS).

Causes of Failures.

	March 1 to Oct. 1, '93. No.	Oct. 1 to Feb. 28, '94 No.
Relay point not in contact	7	6
Open circuit, battery jar broken	3	1
Instrument in signal out of adjustment	2	2
Short circuit, caused by spike	1	0
Short circuit, rail contraction	.	3
Imperfect insulation	5	0
Escape in track circuit during heavy rain	2	0
Short circuit in lightning arrester	1	0
Wire grounded	1	0
Relay out of adjustment	1	0
Wire burned out of lightning arrester	1	0
Wire broken in lightning arrester	.	1
Bells out of order	1	0
Switch instrument broken by derailment	.	1
Track wires broken at street crossing	.	1
Unknown	.	1
	25	16

The Heilmann Locomotive.

Your readers are probably tolerably familiar with the much-talked-of plan of a French engineer, Mr. J. J. Heilmann, for introducing electric motors on existing railways without any interruption of or change in present conditions.* After good deal of experiment, a full power engine has been built to Mr. Heilmann's designs by the Société des Forges et Chantiers, at Havre, with the assistance of Messrs. Brown, Bouveri & Co., one of the leading Continental electrical firms, and with the approval and co-operation of the officers of the Western Railway of France. Last Saturday I joined a party of English and Continental engineers to see a trial trip of this locomotive, during which very successful running was made to Beuzeville and Havre and back, on the main line to Paris. The profile of the road on this stretch is

Level	for	590 ft.
Up grade of 3 per cent	"	4,480 "
Down grade of 2.5 per cent	"	11,800 "
Level	"	6,830 "
Down grade of 3.4 per cent	"	3 700 "
" 8 "	"	36,140 "
" 1.5 "	"	590 "
" 3 "	"	1,410 "
Level	"	2,330 "
Down grade of 3.3 per cent	"	9,510 "
Level	"	7,100 "
Total in one direction		84,480 ft.

The sharpest curve is 5.3 deg., coinciding with the steepest grade. Running up the 8 per cent. grade, the maximum speed attained was 28 miles. The trainload was 72 tons. The designers say that the coal consumption has been only 25 lbs. per mile, against 42 lbs. which would have been used by the ordinary locomotives on this stretch. The cost of the trial locomotive has been $40,000, but it is said that it can be duplicated for $28,000.

The essential feature of this locomotive is that it may be called literally "self-contained," and thereby obviates the technical difficulties and expense of electrical conductors laid along the line. To one imbued with the spirit of mechanical engineering—whose especial characteristic is common sense—the idea of the Heilmann locomotive is at the first blush absolutely absurd. It comprises, first, a steam boiler (just as in the ordinary steam locomotive), with tanks for water and fuel around it; a steam engine, which drives a very powerful dynamo or electric generator; and lastly, a series of electric motors, one of which is mounted on each of the eight axles carrying the entire weight o the locomotive.

* See *Railroad Gazette*, p. 337, 1893, and p. 163, 1894.

One's first thought is, of course, that there can be no possible saving of expense, as not only is the weight and cost of the locomotive increased by the extra weight and cost of electric generator and motors, but the additional transformation of energy must of necessity give a less net percentage of that contained in the fuel than if the steam were used simply to drive the wheels around, as in an ordinary locomotive. This latter statement is, however, called into question by M. Heilmann and his supporters, who claim, indeed, that owing to the great efficiency of electrical apparatus a positive economy is obtained by its use.

Briefly summing up the advantages put forward with considerable force in advocating this new system, it may be admitted that the locomotive stability is greatly increased at high train-speeds owing to the absence of reciprocating parts connected to the wheels. The motion of the electric motors is wholly rotary, and a steady pull results instead of the violent jerks of an ordinary steam locomotive. For the same reason, and because coupling rods are avoided, the locomotive is enabled to travel round sharp curves at high speed. The fact of each axle being provided with a motor shows that the adhesion and driving power are greater than with steam locomotives. Of course all these advantages are common to almost all systems of electric railways; but in the Heilmann locomotive it is claimed that they are given in a way which opens up at once the road to a gradual introduction of electric traction on ordinary railways without the great expense of line conductors and generating stations otherwise necessary.

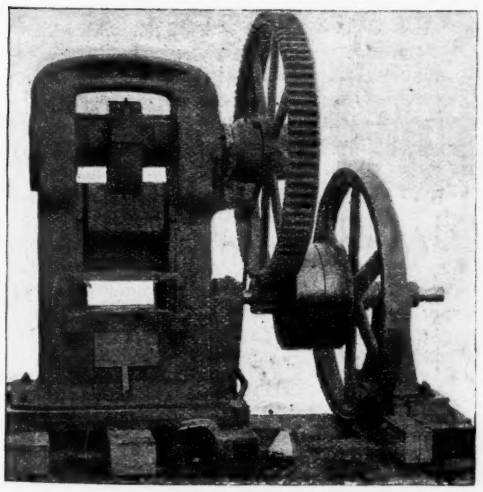
At the trials recently held a train of five or six ordinary carriages was taken by the Heilmann locomotive with perfect ease along the steep grades out of Havre, and a speed equal to the maximum allowed by the railway company (50 miles per hour) readily attained. From an electrical point of view, the details could not well be much improved. A mechanical engineer might with justice find fault with the type and manual of working of the steam engine used to drive the dynamo generator. This, however, is remediable. The whole device must stand or fall, as regards its use on ordinary lines, with the practical results only to be obtained by careful tests under working conditions. These have been carried out by the Western of France railway officials, and will be published in due course. If they show, on striking a balance between increase of speed and cost of working (due allowance being given to such factors as safety, capital outlay, etc.), that even a slight economy is obtained by the Heilmann locomotive, its use and development will both be fully justified. Meantime it is interesting to note in this contrivance another example of wild probability brought down to practical, if not as yet wholly perfect, reality. F. B. L.

LONDON, Feb. 12, 1894.

Machine for Cutting up Old Ties.

The Pittsburgh, Fort Wayne & Chicago has lately put in use a machine designed and patented by the Murphy Foundry Co., of Alliance, O., for cutting up old timber for fuel, experiments already made indicating that its use will be a means of decided economy.

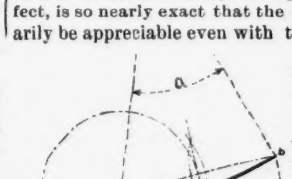
The machine, which is shown in the accompanying illustration, is similar to an ordinary metal shear with a very strong frame, the principal peculiarity being that the upper or movable knife slides in a vertical plane about one inch away from the plane in which the lower or stationary knife is fixed, thus allowing a considerable space for hard substances, like old spikes, to pass through without injuring the knives. The machine has been tested on new timbers 8 in. × 12 in., which it cut off with ease. It can be run conveniently at 20 strokes a minute. As may readily be imagined, a piece of timber cut off in this way is crushed to such an extent that it can easily be split longitudinally, if desired, by hand, with an ordinary axe.



Machine for Cutting up Old Ties.

Rectifying a Circular Arc.

The amount of time and mental energy that has been spent on the problem of rectifying a circular arc will never be known, but its measure if known would be as little grasped at as an astronomical distance. It is perhaps but little known that a method has been discovered which is as simple and as easily applicable as could be asked for, and which, although not theoretically perfect, is so nearly exact that the errors would not ordinarily be appreciable even with the most precise drafting. In fact, except for the dissatisfaction that one has in using a method which he knows to be theoretically imperfect, the method is as valuable to a draftsman as though it really were absolutely without error. This rule was found in the appendix of a little book on drawing. There was no comment or demonstration of accuracy. The real author is unknown.



Suppose that ab is a circular arc subtending the angle α; ad is tangent to the curve at a. Required to lay off along the tangent a length equal to the arc ab. Rule: Produce ab backward to e, making ae equal to $\frac{1}{2}\,ab$; with e as center and eb as radius describe arc bd. Then ad equals arc ab (very nearly).

The only method of demonstration is to compute the amount of the error in terms of the radius.

$$\text{Arc } ab = \frac{\alpha\pi\,R}{180^\circ};\quad ea = \frac{1}{2}\,ab = R\sin\frac{\alpha}{2};\quad ed = 3\,ea = 3\,R\sin\frac{\alpha}{2};$$

$$\text{angle } ead = 180^\circ - \frac{\alpha}{2};\quad \sin ade = \frac{ea}{ed}\sin ead = \frac{1}{3}\sin\frac{\alpha}{2};$$

$$\text{angle } aed = \frac{\alpha}{2} - ade;\quad ad = ed\,\frac{\sin aed}{\sin\frac{\alpha}{2}} = 3\,R\sin aed.$$

Suppose $\alpha = 15^\circ$, the true length of the arc is .2617994 R; the length of ad, deduced from the above formula, is .2617991 R — a difference of *three ten-millionths* of the radius, an error absolutely inappreciable with ordinary radii. As can be seen by the following table the error for an angle of 10 deg. is the same in amount but of opposite sign, indicating that for some angle between 10 deg. and 15 deg. the error is absolutely zero. The error increases much more rapidly than the proportionate increase in the angle, but even when the angle is 45 deg. the error is only .00028 R:

α	Arc ab.	Tang. ad.	Error.
10 deg	.174 532 9 R	.174 533 2 R	+.000 000 3 R
15 deg	.261 799 4 R	.261 799 1 R	−.000 000 3 R
20 deg	.349 065 8 R	.349 061 7 R	−.000 004 1 R
30 deg	.523 598 7 R	.523 562 5 R	−.000 036 2 R
45 deg	.785 398 1 R	.785 117 6 R	−.000 280 5 R
60 deg	1.047 197 R	1.046 008 R	−.001 189 R

To take an extreme case, suppose a beam compass were used with R = 40 in. and $\alpha = 45^\circ$. The error is .0112 in.—an error hardly beyond the limit of accuracy of drafting, and an error certainly much less than would be obtained by "stepping off" some known space with dividers. Even when the angle is known, it is practically as accurate as by a computation of the arc from the formula, $\text{arc} = \frac{\alpha\pi\,R}{180^\circ}$, but when α is unknown, as it generally is, this method will give the required length more accurately than any of the ordinary methods and with an error probably within the general accuracy of the drawing. If $\alpha = 60^\circ$ the error is less than .0012 R; if R = 10 in. (about the limit of radius, using a compass with extension bar) the error is only .012 in. If α is very large and great accuracy is desired, the arc may be divided into two or more angles, which are each so small that the error of each is as small as is worth trying for—remembering that the error for small angles is only a small fraction of the error for larger ones.

It may be remarked to anyone desiring to verify these calculations that it is necessary to compute them with 7-place logarithmic tables, determining the angles to the nearest tenth of a second. If less accurate tables be used, the inaccuracy of the last figure (in determining proportional parts) will invariably cause the error to appear as very much more than its true value, at least for the smaller angles. WALTER LORING WEBB.

PHILADELPHIA, Feb. 27, 1894.

Behavior of Masonry in Freezing Weather.

The *Zeitschrift des Oesterreichischen Ingenieur- und Architekten Vereines* publishes interesting results of experiments on the behavior of masonry, from which we abstract the following:

During the construction of a public building at Zurich, which threatened to be much delayed by frost, the architect requested an expert opinion from the Society of Austrian Civil Engineers on the qualifications of fat lime, hydraulic lime and Portland cement for laying masonry in freezing weather. The Society appointed a committee which decided to gather outside information on the subject and to make experiments.

They learned that in St. Petersburg, if it becomes necessary to build in cold weather, the water for mixing mortar is warmed and sometimes salted. In laying large cut stones, alcohol with an admixture of soap is used instead of water. Either Portland cement or fat lime is taken. Brick and stones are stored in sheds and the finished masonry is covered with straw mats or boards. With such precautions masonry can be laid without harm at temperatures down to 18 deg. F.

Experiments by Riggenbach, in Hamburg, with mortar of slow setting Portland cement, exposed to frost, showed that the setting was delayed, but that the mortar reached later almost its normal strength, especially when a thaw came. Cubes of brick masonry, of 10 in. side, made with Portland cement, gave the same results. Dyckerhoff states, in a paper read in 1888, that Portland-cement mortar used in frost slowly attains its ordinary strength. The mortar should be as dry as possible. The experiences of other engineers are that brick should be used dry when laid in freezing weather. Investigations made in Christiania did not prove that brickwork built with unslaked lime mortar in winter is damper afterwards than when laid in summer. The difference between the temperature of the air and that of the mortar cools the latter by evaporation and removes part of its moisture. It is not considered economical to work at a temperature lower than 10 to 14 deg. F., as the difficulties increase with the cold.

The experiments of the Commission were made with brick and with ashlar masonry. The stones were used dry and free of frost, and the mortar was made very stiff.

Experiments with Brickwork.—The blocks were 1 ft. by 3 ft. 4 in., 6 ft. 7 in. high, built with fat lime, with Roman-cement and with Portland-cement mortar. The mortars had 1 part binder to 2 parts of sand. In one set of blocks the water was used as taken from the hydrants, while in another set the water was heated to 77 deg. F. In some more blocks seven per cent. of the weight of the water in salt was added to cold water. The lower half of the walls was protected by a wood casing against the direct influence of the frost, while the upper half remained unprotected. The bricks were laid in January in temperatures varying from 3 deg. to 26 deg. F., and were taken down in June, 1891. The inspection showed that the joints of fat-lime mortar had suffered more in the unprotected parts, being frozen. The joints were scraped in various places and the walls then taken apart. The results were the following: The fat-lime mortars, mixed with cold or warm water, had set little and showed slight adhesion to the bricks. The Roman-cement mortar, with cold water, had set moderately well in the joints and in the interior, and adhered quite well. The joints of the Portland-cement mortar, mixed with cold water, were hard and the adhesion was good. The protected part showed better. The use of warm water had improved the Roman-cement and Portland cement mortars slightly. Roman-cement, with seven per cent. salt to cold water, gave a brittle mortar and little adhesion to the bricks. The Portland-cement mortar, for which cold water and seven per cent. salt had been used, had set very well and showed good adhesion.

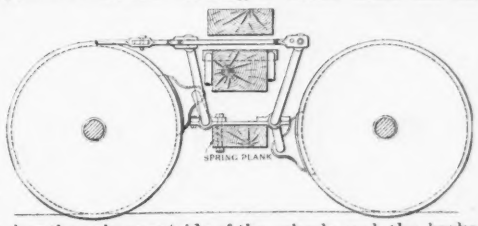
Experiments with Ashlar Masonry.—The blocks, 3⅛ by 1⅗ ft., 6 ft. 8 in. high, were built of limestone in January, 1893, in temperatures between 7 and 25° F. The same mortars were used as above. They were taken down in the April of the same year. The fat-lime mortar, with cold and with warm water, was found to be frozen and entirely brittle; it did not adhere to the stone. The Roman-cement mortars had set quite well, but the connections with the stones was wanting, from which latter the mortar separated entirely. An admixture of salt to cold water and Roman cement had made the mortar set better, and the latter adhered partly to the stones. The mortar joints of Portland cement had set very well and there was considerable adhesion. Where salt had been added the joints were very hard and adhered very well.

Conclusions.—The conclusions drawn are that only Portland-cement mortar, especially with an admixture of salt, is adapted for laying masonry in freezing weather.

The Porter-Maechling Beamless Brake.

The illustration shows a beamless brake, consisting of a pair of rocker arms, and levers with shoes attached to the arms, one above and the other below the spring plank, which is the fulcrum. The connections are also shown, and the extra holes by which the slack may be taken up. A brake slack adjuster might be employed as well.

The advantages of this brake are those usually claimed for beamless brakes, the saving of large expense for beams, the dangers due to broken and fallen beams, and in addition, economy in repair of trucks, simplicity of connections and instantaneous effect of power applied to brakes. Nothing is visible under the car below the axle or outside of the wheels, and the brake is readily adapted to the connections now in use. The brake can be applied to freight cars at from $6 to $8 a car and to passenger cars for $8 or $10. It may be applied to any truck regardless of style or number of wheels.



In some recent tests on the New Orleans & Grand Isle Railroad a car going at 12 miles an hour was repeatedly stopped in distances averaging from 30 to 40 ft. from the point where the brake was applied.

The patentees are represented by Mr. Charles F. Porter, 61 Charles street, New Orleans.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The contest of the Demurrage Bureaus with consignees who think that a demurrage charge is a wicked imposition upon them, continues to be heard of here and there. A week or two ago we noted a case in Cleveland where the magistrate of a local court allowed the whole question of the reasonableness of a demurrage bill to be settled by the jury. His charge to them evidently was a very mild one, as they decided that the consignee need not pay anything, though in every other recent case that we have heard of it has been held that a reasonable demurrage charge is legal. The latest disturbance reported is at Holyoke, Mass., where a number of consignees, mostly papermakers, who receive large quantities of rags, and who have heretofore saved storage room by storing in cars, have appealed to the legislature. They begin, of course, with the claim that the railroad ought to pay demurrage to them when goods are delayed on the road. This is a plausible argument and has been familiar ever since demurrage was first thought of. It is to be hoped that the Holyoke men will be made to see that it would, if it prevailed, do them more harm than good. Any scheme to make adjustments on the complicated basis of delays, avoidable and unavoidable, would break down of its own weight, howsoever just the principles which it might be attempted to carry out, and the result would be only a lot of unnecessary vexation for all concerned. Such a scheme would involve constant comparison of good and bad, of debit and credit items, all intangible and of a nature to be judged by each party by guesswork; while the present demurrage plan has the advantage of being very simple. It only attempts to mitigate what every one admits to be an evil—the use of cars as storehouses. Rather than try to allow for delays and do it equitably—and of course there are numerous delays which inflict pecuniary damage on consignees and which the carrier must allow for in some way—the railroads would better reduce demurrage charges one-half. And, in fact, this is just what they are doing. One dollar a day, or even two dollars, is very small pay for the use of a freight car and the ground it stands on. Four days free time in which to unload, which is the rule in Holyoke, is too liberal. In four days a car could travel a thousand miles and its owner could thereby earn a hundred dollars which could not be earned without the car. Railroads often get $10 for four days' use of a car lent to another road.

The Holyoke people also want credit for cars unloaded in less than the free time allowed. This is a reasonable claim if the free-time limit is rightly adjusted, but four days is too long. At Cleveland, the plan of charging only for detentions over 24 hours, provided the consignees will sign an agreement to take reasonable measures to prevent delays, has worked with great satisfaction for a year and a half, and over a third of the cars handled by the Cleveland Association are now charged for on that plan (8,740 cars in February) The basis of the plan is explained by an example, thus: A party receiving 1,000 cars in a month finds, at the end of that term, his demurrage bill is $100, the charges having been entered against him according to the ordinary rules. The detention on all his cars, including those which have been unloaded promptly, is then computed and found to be 25,000 hours. Of this, 24,000, equal to one day each, for the 1,000 cars, is deducted, leaving 1,000 hours to be paid for. This is divided by 24, making 41⅔ days, which, at $1 a day, equals $41.66; and this is the amount to be paid, instead of $100, as would be the case under the ordinary rules. The consignee gets this direct advantage, and the railroad gets the indirect advantage of a definite agreement by which all the usual friction is obviated.

The third grievence of the Holyoke men is not so easily disposed of. They complain because demurrage matters are in the hands of the association manager, 35 miles away, instead of being under the control of the local freight agents of the several roads. Every railroad manager knows why he makes this arrangement; it is because the man who must be constantly engaged in pleasing customers cannot be allowed discretion in a transaction which is sure to displease them; but it is hard to present a suitable explanation or apology to the customers. If every station agent were a $10,000 diplomat, perhaps he could adjust demurrage bills so as to get the cars unloaded and still retain the friendship of the consignees, but no ordinary fellow can do it. Probably no man can do it with reasonable success under present conditions unless he can have *at least* 35 miles between his office and the people he has to deal with. Such very fragile things have to be well cushioned. Probably the best the Holyoke roads can do will be to promise a very good telegraph line to the demurrage manager's office. It should not be a telephone, unless the manager has some vigorous assistants to relieve him some of the time.

The Movement to use Green for an "All-Clear" Night Signal.

It is reported that the London & Northwestern has decided to change all its lamps in fixed signals, so that the indication for all-clear shall be a green light instead of a white one. Green lights have been used for all-clear at some places on that road for several years, so that the present action must have been taken only after ample deliberation. The Great Northern of England has used green for all-clear for many years, and the Midland some time ago decided to adopt the same practice. In this country the Chicago & Northwestern has long been a consistent advocate of the use of green for all-clear, and it has a large number of signals arranged in this way. The growing favor in which this idea is held, as shown by these instances, has not been without its effect on railroad men who read, and it now seems likely that the signal committee of the American Railway Association may, at the April meeting, report in favor of the adoption of this principle as the standard of the Association. The *Railroad Gazette* has kept this question before its readers, presenting the arguments in favor of the change whenever occasion offered, and the principal arguments on both sides were set forth in an editorial on Jan. 2, 1891; but as these are somewhat complicated and as some of those on either side are offset by others nearly as strong on the opposite side, it may be well to recount them briefly here.

The use of green for all-clear in fixed signals implies the use of red for danger; and then for caution we must use either a white signal, or a light of some third color (blue, purple or violet), or a form signal. (It is to be remembered that the English use red in distant signals and that therefore the question now before us does not trouble them.) The arguments for leaving things as they are—"letting well enough alone"—are:

(1.) White is not very dangerous. Although there are numerous white lights which tend to confuse an engineman, all enginemen become perfectly familiar with the minutest details of the location of lights on their runs, so that they rarely have difficulty in picking out the proper signal light. (2.) White is consistent with the all-clear signal used in the daytime and thus conforms to long usage, which it is undesirable to disturb. (3.) There is no satisfactory third color. Green and red are the only colors (excluding white as not being a color) which are readily distinguishable from one another and which can be made visible at a long distance. Even green is objected to as being hard to make visible with ordinary lamps at long distances. Blue-green has been used so much for signal lenses that pure blue would, if used, be confounded by some men with green; and some are slow to distinguish blue from green, even under favorable circumstances. If green were used for all clear and blue for caution, this possibility would be a considerable element of danger. To all these arguments the advocates of the illuminated semaphore add the plea that that device has been or will be perfected so as to obviate the necessity of further improving our color signals.

The first argument in favor of discarding white for the all-clear signal is that the breakage of a colored glass, whether it be a danger or a caution signal, changes that signal to an all-clear signal. This accident has occurred at many places, though it has rarely done much harm. Every one admits, however, that the possibility of a serious collision from this cause is always present. The next argument is that an engineman may run into danger from the false indication of a street light or a lamp in a dwelling-house. This is a positive danger, but any inconvenience or danger of this kind is not very likely to come to the notice of the Superintendent, and therefore its true gravity cannot be accurately estimated. The fact that most signal lights are on high posts reduces this danger, but it is desirable to use shorter posts; and, moreover, the increasing use of street lights on high masts and the additional complication due to the constant erection of new houses in thickly settled parts of the country increases the liability that one light may be mistaken for another. Not long ago the writer noticed a white signal light on a high switch stand which was exactly in line (from an approaching locomotive) with an electric street light a mile or more beyond, and in certain conditions of the atmosphere the difference in intensity or color of these lights would not be noticeable.

These are the two main arguments for a change. Another point on the conservative side is met by the assertion that white need not be used in the daytime for all clear. Flags and switch targets could be changed as readily as lamp lenses. On a semaphore arm neither white, green nor red is suitable, because a change of the position of the arm changes the indication of the signal, while the color remains unchanged. Again, the claim that every engineman is perfectly familiar with his route is controverted by the fact that accidents occasionally occur in which the cause is attributed, in part at least, to the unfamiliarity of the runner with the signals at some place which he has not visited for several months.

Of the two main arguments, therefore, one is based on an actual danger which has not yet proved very great, and the other is based on a danger which is generally admitted to exist, theoretically, but which is not susceptible of proof in precise terms. Notwithstanding this, they have found a good deal of favor, and the white probably would be replaced by the green without much opposition if a satisfactory distant signal could be devised. On this question there will doubtless be much difference of opinion, and it is to be hoped that the meeting of the Association will bring out some intelligent discussion.

It should be noted in passing, however, that the use of green for an indication exactly opposite to that given by red necessitates the careful exclusion of all color-blind persons from the train service, for nothing is better settled than that such persons confuse red and green. The worst color-blinds judge of each of these colors by the intensity of the light, which, whether red or green, appears to them exactly like a plain glass smoked to the proper degree of blackness. A test of eyesight should be a regular thing on all railroads, whatever signals are used, but it will be especially necessary if this change is made; and if violet is used a test of acuteness of vision as well as of color sense will be important, because that color is harder to make visible at a long distance.

In discarding "white" lights from the important position they now hold, and in searching for a satisfactory third color, two or three things should be assumed as settled, to start with. First, every green glass should be pure green, and not bluish. By green we mean a green image as it appears to the eye when an ordinary flame lights the glass. Second, all signal lamps should be made with large lenses and large burners, and be firmly supported on the post; and they should be well cared for. Nine-tenths of the objections presented by railroad officers to the use of colored lenses would be swept aside if we could get rid of all the small, poorly constructed lamps, with lenses placed too high or too low or at a wrong angle. Third, distant signals need not be visible a great way off. Every one should settle in his own mind how far he wants his signals to be seen. A violet signal can be readily

arranged to show well at, say, 500 ft. Every one knows that to run trains safely at high speed in times of fog the signals must be so located that the engineman need never slacken his speed more than 500 ft. before reaching the signal. This being so, why try to provide a caution signal to be visible farther than that distance? Fourth, a violet light should be reddish rather than bluish, so as to be more like a danger signal than like a safety signal.

The Chicago & Northwestern arrangement of red and green for caution has worked to the satisfaction of the officers of the road.* If an engineman discerns the light long before he gets to it he may call it red (the red being larger than the green) and prepare to stop on reaching it, but this problematical objection proves to be of no moment in practice, for before the train gets near enough to necessitate material reduction of speed the green is discernible and the actual indication of the signal is understood. With green used for all-clear, white will be available for a caution signal. White might be substituted for the green in the Chicago & Northwestern signal.

The Boston & Albany has used successfully, for years, a semaphore signal which gives its night indication by form entirely. It would introduce practically no complication (except additional expense) to place three white lights on every distant signal post, two to be shown in a horizontal line to indicate caution, and two in a vertical line to indicate all-clear.

Any one of these three schemes (violet, red-and-green, or colorless) could doubtless be introduced with perfect safety. The introduction of green for all-clear on fixed signals ought to be followed by the abolition of green as a tail signal on trains, but this necessity should not hinder the movement. If the three principal points are kept in mind—that violet, though inferior to red and green, is good enough for a caution signal; that the feasibility of the various schemes proposed is attested by actual experience in the hands of expert signal engineers and superintendents; and that the alleged difficulties affect only one class of signals—the distant signals—there should be no great delay in agreeing upon this simple plan to get rid of both of the two serious objections to the use of white lights for go-ahead signals. With large, well made lamps, standard colors, strictly adhered to, and abandonment of the attempt to make signals visible any farther than is necessary, the chief difficulties of the problem vanish.

Cheap Railroad Working in India.

We have heretofore called attention to the remarkably low cost of working the more important Indian railroads, and to their extraordinarily low passenger fares. We have now the "Administration Report on the Railways of India" for the fiscal year ending with March, 1893; and this shows, reducing the India currency to its value in our own, even more remarkable results than any heretofore chronicled in India or elsewhere. We give warning, however, that the appearances are to some extent deceitful, made so by the recent great depreciation of the Indian currency, based on the silver standard, and the peculiar social and economic condition of the population, where prices and wages are established by *custom* to an extent unknown in Europe or America, so that a large part of them have remained unaffected by the great depreciation in the currency. Those of us who can remember the depreciation of our currency during the war and afterwards will remember that while the price of gold was going up (or the value of the greenback currency going down), prices of all commodities followed the price of gold with great agility, and wages, though they could not be changed from day to day, still kept step with all considerable fluctuations in the currency. Salaries, fixed for the year, were sometimes changed in spite of contracts, because they were too evidently unjust when the value of the money in which they were paid had fallen one-third or one-half; but salaried men and all receiving payments on time contracts often suffered seriously. The common soldier, for instance, had been paid $13 per month in gold. When gold had risen to about 140 this was advanced to $16, but there it remained throughout the war, though gold averaged about 146 in 1863, 205 in 1864, and 157 in 1865, so that in the second of these years the soldier's pay was equal only to about $7.80 of the currency in which he was paid when the war began.

In India the depreciation of the currency is felt to its full extent in all importations of foreign goods, and probably in the price of breadstuffs—at least in those a surplus of which is exported in competition with other producing countries; but the average native consumes very little of any imported commodities, and it has so happens that wheat (the food of probably not one-fourth part of the population) has fallen in price about as much as silver of late years. At least there appears to have been no change in the wages of the great mass of Indian railroad employees, and no advances in fares and freights on account of the depreciation of currency. The railroads have had to pay in gold for all their imported supplies, and for substantially the whole interest on their capital; but for their native supplies they have paid in silver probably at just about the old rates, and for wages also. Thus the rates, cost, etc., which we have reduced to our currency at the average rate of exchange of the year, which was just about 37½ per cent. less than the value of the currency when the silver in a dollar is worth a gold dollar, may seem too small. But it is absolutely true that for sums in gold equal to those we give, so much transportation was to be had, and the cost of it paid for by the railroads during the last fiscal year. It was not intended that it should be so—that is, the fares and freights and wages were fixed when they were worth more in gold than they are now—but it actually *is* so.

The Indian railroad system at the close of the year covered by the report included 18,042 miles of railroad, of which 14,211½ miles were owned by the Indian government or by native states (1,380 miles by the latter). The larger part of the government railroads are worked under contract by companies, generally the companies which originally built and owned them. The government guaranteed interest on their whole cost under contracts which authorized it to buy the roads when they made profits exceeding a given amount. When it has exercised this authority, the old company of course had all the staff and supplies required for working the road, and in most cases it has contracted to work it for a share of the profits. Yet the Indian government works directly 4,992¼ miles of its railroads, and the native states 787¼ miles, which together make nearly one-third of the Indian railroad system, nearly 79 per cent. of which they own. No less than 7,451 miles of the system are of the meter gage, and 245 miles are of 2 ft. and 2 ft. 6 in. gage, the latter now classed with tramways and their operations not covered by the report. Within the last two fiscal years, of 1,167½ miles of new railroad opened in India, 891 miles were of meter gage. The standard gage of India is 5 ft. 6 in., as that of Canada was once; they adopted it at about the same time.

The length of railroad in India is just about equal to that in Russia in Europe. India has 18 per cent. less territory than Russia, but three times as many inhabitants. The latter in India number about 15,000 per mile of railroad, against about 2,700 for all Europe, 2,200 in Europe exclusive of Russia, and 385 in this country. With so few railroads in so large a country, of course no railroad is accessible to a large part of the Indian population, and it is not so true of the lines there that they have 15,000 people to support each mile, as it is of those here that they have 385 to support them. Nevertheless, the number of those who directly contribute to the traffic of the Indian railroads is enormously greater than here, in proportion to mileage.

The average length of railroad worked in the last fiscal year was 17,677 miles. The average cost per mile, reckoning the currency as equivalent to gold, as it was when nearly all the lines were built, had been $74,931 per mile for the 5 ft. 6 in. lines, $32,715 for the meter lines, and $54,926 for the average of all. The earlier lines were made unnecessarily costly, and were built at a time of high ocean freights, and these are all of 5 ft. 6 in. gage.

The average gross and net earnings and working expenses *per mile* of road in the year reported compare as follows with those of the railroads of this country in the year to June 30, 1892, as reported by the Interstate Commerce Commission:

	India.	U. S.
Gross earnings	$4,245	$7,213
Working expenses	1,992	4,809
Net earnings	$2,253	$2,404

Thus our railroads earned per mile $2,968 more gross, but only $151 more net than the Indian railroads, the cost of working being 141 per cent. greater here. The Indian gross earnings per mile were 6.85 per cent. less (in rupees) than the year before, but the greater depreciation of the currency made the loss actually greater. The decrease was substantially wholly in freight earnings.

The working expenses were 47 per cent. of the gross earnings in India and 66⅝ per cent. here.

With so dense a population, naturally passengers form a larger proportion of the traffic in India than here. In fact, the passenger mileage was very nearly one-fourth greater than the ton-mileage there; here it was about 15 per cent. of the ton-mileage; but freight rates being higher than here, and passenger rates very much lower, the passenger earnings were not much more than half as great as the freight earnings in India, and but 33¼ per cent. of the total earnings, while they were 29⅜ per cent. of the total earnings here. The average traffic was equivalent to a movement each way daily of 408 passengers and 361 tons of freight over the whole system in India, against 113 passengers and 744 tons of freight in this country. Their passenger traffic is 3⅝ times as heavy as ours; their freight traffic less than half as heavy.

Now all this traffic was carried with a train movement equivalent to only 4.3 trains each way daily. So very large a proportion of these were mixed trains that we cannot well divide them between passenger and freight trains, but the report assumes to do it by assigning a certain proportion of the mixed trains to each class, making thus 46 per cent. of the whole, passenger trains. The average train-load was 209 passengers and 140 tons of freight on the principal broad-gage roads; 231 passengers and 78 tons on the meter-gage roads; against an average of 42 passengers and 182 tons of freight in this country. Such passenger train-loads as in India are unknown elsewhere in the world. They are *five times* as great as ours.

Taking all trains together the Indian standard-gage roads earned $1.37 gross and 74 cents net per train-mile; the meter roads 98 cents gross and 49 net; the working expenses being 62 cents and 49 cents respectively. Reckoned in silver the cost per train-mile is only 85 cents on the broad and 67 on the narrow-gage roads, and that with the train-loads we have described. Here passenger trains are reported to have cost 58 cents and our freight trains $1.06 per mile, our passenger trains earning 90 cents gross, against $1.03 on the broad and 98 cents on the narrow-gage in India; our freight trains, $1.65, against $1.55 and 81 cents on the two gages in India. We made a profit of 58 cents per passenger and 32 cents per freight-train mile; the Indian railroads, a profit of 74 cents per train-mile (of all kinds) on the broad and 49 cents on the narrow gage lines.

The average passenger fare in India was 0.469 cent gold per mile on both gages,—in the silver currency of the country 0.645 cent—not to be matched elsewhere in the world; ours was 2.126 cents. The average freight rate was 1.023 cents per ton-mile, against 0.898 cent here, or 14 per cent. higher. If our railroads had carried at the Indian rates their freight earnings in 1891–92 would indeed have been $110,000,000 greater, but their passenger earnings would have been $221,000,000 less.

The net earnings of the Indian railroads were nominally 5.43 per cent. on the total capital outlay on them in 1892-93, and 5.76 per cent. the year before. As these net earnings were in depreciated silver, and nearly all the capital was equivalent to gold when expended, and interest on it now has to be paid in gold, this is misleading, as were the accounts of our railroads during the war. In spite of the apparently satisfactory return last year, the Indian government suffered a net loss in connection with the whole Indian railroad system amounting to about 98 lakhs of rupees, worth $3,165,400 in gold at the average rate of exchange, against a profit of 18½ lakhs of rupees the year before, when the rupee was worth more. The average profit (silver) on the state lines was 5.22 per cent. on the capital; two-fifths of this profit was from the East Indian Railway, worked by a company, whose net earnings were 9.62 per cent. on its capital, the other state lines averaging 3.03 per cent.

The most striking results are seen on individual lines. The Madras Railway has the lowest average fares, amounting to 0.301 cent. per passenger mile, which is at the rate of $2.90 from New York to Chicago, 70 cents from New York to Boston or Washington, and a little more than $10 from New York to San Francisco. Adding three-eighths to get the rates in silver, this is still cheap traveling. This railroad had a passenger traffic equivalent to 567 each way daily, which is two-fifths more than the average Indian railroad, but far below that of some of the lines. Its freight traffic is light, even for an Indian road, and 71 per cent. less than the average here. Its average train-load is no less than 274 passengers, and it has only 4.1 trains each way daily to handle both kinds of traffic, an average of 2.07 passenger trains. Its expenses per passenger-mile are 0.175 cent, which is greater than on some other lines. Its trainmen cost it 1.2 cents per train mile. Ninety-seven per cent. of its travel was of fourth-class passengers; but the other 1 per cent. paid 11½ per cent. of the passenger earnings.

More notable is the East Indian Railway, which has 1,610 miles of railroad in the Ganges Valley, where there is a population of 500 per square mile—twice as dense as that of the United Kingdom, and three times as great as that of Massachusetts, the

* This signal was illustrated in the *Railroad Gazette*, May 8, 1891.

most thickly populated of our states. Its traffic in 1892-93 was equal to 823 passengers and 967 tons of freight each way daily, carried with an average movement of *eight* trains each way daily, three of which were mixed trains, composed on the average of 15⅞ passengers and 3⅝ freight cars, while the passenger trains had 14.36 cars besides brake van, and the freight trains 34 cars. With this light train service, carrying an average of 247 passengers or 211 tons of freight per train, it hauled this heavy traffic, earning gross on the average of all trains $1.65 per mile at an expense of only 47¼ cents, leaving $1.17¼ net. The average receipt per passenger train-mile was $1.26; per freight train-mile, $1.88.

The average fare is higher than on the Madras Railway, being 0.453 cent per passenger mile (0.723 silver). Fourth-class travel is 92.6 per cent. of the whole, yielding five-sixths of the passenger earnings. The reported average *cost* of carrying a passenger on this railroad is 0.1026 cent per mile! Thus, in spite of the very low fare, more than three-fourths of it is considered profit.

The result with the freight traffic on this railroad is not so astounding, but sufficiently satisfactory. The average rate per ton-mile is 0.81 cent, which is higher than on many of our roads, but the average cost of carrying it is only 0.242 cent, which we cannot equal. Even the cost in silver, 0.333 cent per ton-mile, can hardly be matched in this country, and certainly nowhere else in the world. It was 0.340 cent on the Philadelphia & Erie in 1892, and 0.394 on the Pennsylvania Railroad Division of the Pennsylvania; 0.379 on the Norfolk & Western. The Philadelphia & Erie only earned 0.495 cent per ton-mile, and the Pennsylvania Railroad Division 0.571 cent, while the East Indian made a *profit* of 0.568 cent. per ton-mile. With such a profit the Pennsylvania Railroad would have made 52 millions net on its freight business east of Pittsburgh and Erie, or double its actual net earnings from all sources, which would have been a gain of 9 millions had it carried its passengers for nothing. The Pennsylvania's passenger traffic per mile of road is little more than half as great as the East Indian's; but its freight traffic is four times as great. The New York Central's passenger traffic is 38½ per cent. lighter; its freight traffic 160 per cent. heavier.

As to the causes of this low cost of working, we see by the large proportion of mixed trains and the great number of cars in the passenger trains, as well as by the great passenger train loads, that this traffic is handled by few and heavy rather than by frequent and light trains, and doubtless at very moderate speeds, and we know generally that the wages of natives are very much lower than European wages, even. Formerly it was thought necessary to have Europeans for the higher grades of employees, such as enginemen and station agents; but natives are now employed in almost all capacities, as may be known by the fact that of a total staff of 258,760 employees on the Indian railroads at the end of 1892, no less than 248,446 (96 per cent.) were natives, and only 4,507 were Europeans. The other 5,807 are entered as "East Indians," being Indian-born descendants of Europeans. The number of employees per mile was 14.1, against 5.06 here.

Formerly the chief fuel used on Indian railroads was Welsh and English coal imported at great cost for carriage. Ocean freights are now so low that a Bombay line—perhaps the only one which still uses British coal exclusively—in 1892 secured its supply for about $4.50 per ton. But native coal has been developed, and in the year reported the railroads consumed 875,996 tons of native coal, and only 204,603 of English, besides 300,682 *tons* of wood, and a little coke and patent fuel. The supply of the East Indian Railway came from its own mines, at a cost of 71 cents silver, or 52 cents gold, per ton; and its expenditure for fuel per train-mile—heavy trains—was only 1.52 cents. At the same time, trainmen cost it only 1.72 cents per train-mile, the trains being very long. On another line this expense was only 1.12 cents, and on one meter-gage road only 0.2 cent per train-mile—a sufficient indication that wages are very low.

It used to be said in the early days of the Indian railroads that they were ill calculated for the wants of the country, being built and worked after English models. But it is to the credit of their managers now that they have discovered that a very large passenger traffic could be developed by accepting such rates as the natives could afford to pay; and that such traffic could be made profitable if limited to those accommodations which were acceptable to the natives. This was a radical diversion from English practice. And though the *average* freight rates would not be called very low in this country, some staples (as wheat) are carried at charges approximating ours, and hardly known in Europe.

Counterbalancing in the Laboratory and on the Track.

The Purdue tests have brought out a good deal of counterbalance literature. Among the letters on the subject that we have received are certain ones inquiring about the difference between the effect of counterbalancing in actual service and at Purdue. Another one of considerable interest we quote from:

"When the —— works first began building engines for this company, we required them to balance the wheels on trestles and pour in an amount of weight in the counterbalance pockets to correspond with the whole weight of reciprocating parts in addition to the revolving parts. This has been standard with us for many years, and has made our engines run with remarkable smoothness. Of course it makes a heavy blow, but we cannot say that we have had any special trouble from broken rails; certainly none has been traced to this cause. The locomotive works kicked about the extra work, and finally we gave them the weight of lead to be used, as derived from our experience. The work was rushed out and they failed to put any counterbalance in at all, and the result was we could hardly get the engines over the road, and I finally had to take them all into the shop and counterbalance them. My own impression is, all we can do is to make our reciprocating parts just as practicable with the necessary strength. Probably nine-tenths of the reciprocating weight should be counterbalanced in addition to the revolving parts. When this has been done about all has been done that can be, and I do not think any amount of mathematics or discussion will reduce this further. Nothing but an entirely different construction would ever overcome the trouble."

This letter we do not propose to discuss; we simply have a word for the correspondents of the other class.

Of course there are differences of considerable magnitude between the conditions at Purdue and those in practice; but the Purdue experiments are useful because they are indicative. They tell us, first, that under certain conditions locomotive drivers actually lift from the rails at one point of revolution and exert a very great pressure on the track at another point of the same revolution; second, they indicate that the main wheels lift less than the other wheels when the engine is going ahead, and probably lift more than the other wheels when the engine is running backward. These facts about matters that have been the subject of speculation before are worth all the time and trouble taken to gather them, and will stimulate inquiry to learn more about the effect in actual service and will encourage designers to take more intersst in the important matter of reducing the total weight of reciprocating parts.

The differences between the conditions of the Purdue tests and actual service are somewhat as follows: In service, since the use of heavy engines, it has been found possible to reduce the weight of balance used for reciprocating parts by about 33 per cent. without producing so much shake of the engine as to be disagreeable to engineers and firemen. At Purdue, in order to make the engine ride steady, it was found necessary to balance all reciprocating weight, just as was formerly done on all engines and is now being done on some roads in this country. In fact, it is the avowed practice on some roads to do this so that the engines may run with the greatest steadiness. In Europe it has been a practice to hang the engine up by chains and run it with the wheels off the track in order to measure the oscillations. This is nothing more nor less than a shop test of counterbalancing applied to a locomotive. When a locomotive is hung up in this way it is found that a pencil attached to the front end will describe an ellipse, and the counterbalancing is changed until the ellipse is reduced to the smallest practicable amount. This practice results in the use of nearly full counterbalance for the reciprocating parts. Hence, the conditions of the Purdue tests, while unlike the common conditions, in the matter of the weight of counterbalance are an exact reproduction of the conditions which exist to-day on some roads in this country and on many roads in foreign countries.

In service the roadbed is comparatively flexible and its inertia is small. The rails are supported on wooden ties that are very elastic cushions when compared to the weights and pressures involved. When the ground is frozen the roadbed is more rigid, but still elastic, and its inertia is small; and even in the case of broken stone ballast the inertia is much less than that of the foundation and wheels and bearings of the Purdue plant; therefore, one difference between the conditions at Purdue and the conditions in service lies in the difference of elasticity of the surface on which the drivers revolve and the inertia of the masses under those surfaces. It is not to be expected that the deflection of the carrying wheels at Purdue is as great as would be the case in actual service, and there may be, because of the greater comparative rigidity of the surface on which the wheels roll, a difference in the amount of the lift of the wheels, but the object of the tests at Purdue was not to show how much the wheels lift in service, but, instead, to show that they do lift, and this was sufficiently well proved for most folk. It as well known before by a few that the drivers of locomotives sometimes lifted at high speed, but no such conclusive proof to engineers in general was had before the Purdue tests.

There is also a difference in the lateral oscillation of the engines. In service the engine rolls and swings to and fro according to the unevenness of the track and its flexibility. At Purdue the track or its equivalent is even, uniform and comparatively inflexible; we do not say that it is rigid. The rolling oscillation will no doubt modify the maximum rail pressure and the lift probably it increases both.

These are the essential differences between the conditions at Purdue and the conditions in actual service.

It has been questioned by a few whether the fact that the locomotive at Purdue was standing still with reference to the earth, while in actual service it moved along the track, did not make a difference in the pressure of the counterbalance on the track and in the centrifugal pressure which lifts the drivers. This is an old question; it was brought up years ago by the enthusiastic devotees of the "hammer-blow" problem. In the literature relating to the hammer-blow, a volume of this kind of argument will be found. That there is no difference whether the locomotive runs over the track or not is apparent without much discussion. In actual service the locomotive runs past or over the track which is fixed to the surface of the earth, while at Purdue the track, which in this case is the surface of the carrying wheels, runs past the locomotive, which is there fixed to the earth. All motion is relative, and it matters not whether the track runs past the locomotive or the locomotive past the track—the result is the same. Of course a mathematical analysis can be made to show all this it may be unnecessary in view of the large amount of practical experience we already have of material things; but when mathematics confirm the deductions from experiment most minds will accept them as proved.

February Accidents.

Our record of train accidents in February, given this number, includes 37 collisions, 65 derailments and 3 other accidents, a total of 105 accidents, in which 15 persons were killed and 58 injured. The detailed list printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	Butting.	Crossing and other.	Tot'l
Trains breaking in two	5	0	1	6
Misplaced switch	2	0	2	4
Failure to give or observe signal.	3	1	1	5
Mistake in giving or understanding orders	0	0	0	0
Miscellaneous	6	2	3	11
Unexplained	5	5	1	11
Total	21	8	8	37

DERAILMENTS:			
Broken rail	3	Wind	3
Loose or spread rail	3	Landslide	1
Defective switch	4	Sand drift	1
Defective frog	1	Washout	2
Broken wheel	4	Snow	4
Broken axle	4	Malicious obstruction	3
Broken truck	1	Unexplained	26
Misplaced switch	3		
Animals on track	2		55

OTHER ACCIDENTS:	
Boiler explosion	2
Wind	1
	3
Total number of accidents	95

A general classification shows:

	Collisions.	Derailments.	Other acc'd'ts.	Total.	P.c.
Defects of road	0	11	0	11	10
Defects of equipment	6	9	2	17	16
Negligence in operating	20	3	0	23	22
Unforeseen obstructions	0	16	1	17	15
Unexplained	11	26	0	37	37
Total	37	65	3	105	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other acc'd'ts.	Total.
Passenger	17	21	0	38
Freight and other	50	44	3	97
Total	67	65	3	135

The casualties may be divided as follows:

KILLED:	Collisions.	Derailments.	Other accidents.	Total.
Employees	10	2	2	14
Passengers	1	0	0	1
Others	0	0	0	0
Total	11	2	2	15
INJURED:				
Employees	21	20	4	45
Passengers	0	12	0	12
Others	0	1	0	1
Total	21	33	4	58

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	0	11	0	5
Defects of equipment	0	1	2	7
Negligence in operating	1	0	10	24
Unforeseen obstructions and maliciousness	0	0	0	8
Unexplained	0	0	2	1
Total	1	12	14	45

Ten accidents caused the death of one or more persons each, and 21 caused injury but not death, leav-

ing 74 (70 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with February of the previous five years shows:

	1894.	1893.	1892.	1891.	1890.	1889.
Collisions	37	84	85	93	64	51
Derailments	65	117	115	93	55	61
Other accidents	3	13	12	10	9	5
Total "	105	214	212	196	128	117
Employees killed	14	45	37	52	50	20
Others "	1	14	7	9	3	3
Employees injured	45	127	55	161	111	39
Others "	13	176	48	114	69	49
Passenger trains involved	38	83	79	85	44	32
Average per day:						
Accidents	3.75	7.64	7.31	7.09	4.57	4.21
Killed	0.54	2.11	1.52	2.18	1.89	0.82
Injured	2.07	10.82	3.55	9.82	6.42	3.14
Average per accident:						
Killed	0.143	0.276	0.208	0.301	0.414	0.195
Injured	0.552	1.416	0.486	1.403	1.406	0.752

February is another light month; that is, the extreme lightness in traffic is accompanied by a brief accident record. The total number of accidents in our report, 105, is less than in any month since June, 1889, and very much less than in any winter month. The total number of persons killed, 15, is the smallest since April, 1890, when the number was 13, and very much smaller than the record for any other month since 1886.

Though only one passenger was killed in February, the month was notable for two derailments of passenger trains which, according to the accounts, were instances of the most vicious train wrecking that we have had in many years. At Roscoe, Cal., on the 16th, guns and dynamite were used in an attempt to kill or injure the express messenger and other trainmen immediately after the train was ditched. Near Houston, Tex., on the 8th, a train was maliciously derailed, and the brakeman who went out to signal following trains was fired upon and wounded. The only accident in which more than one person was killed was the butting collision at Bellevue, O., on the 4th. At Gilbert, La., on the 15th, a woman standing in her own doorway was scared to death by a derailment which occurred naer to the house. The report of the derailment of a train by a high wind in Colorado on the 13th seems to have been a fiction of the reporter.

An electric street car was struck by a locomotive near Newark, N. J., on the 7th, and a similar accident occurred in New Britain, Conn., on the 26th. Nine electric street cars, in as many different cities, were derailed or came in collision with other street cars, injuring 10 or 15 people. One of these derailments occurred on a trestle and the car tipped off.

Our much esteemed contemporary, the *American Engineer and Railroad Journal*, consumes 2⅛ pages in a learned, humorous and perhaps we may say luminous essay on the "Limit of Elasticity of an Average Audience." Quotations from Balfour Stewart, John Stuart Mill and *Punch* suggest the range of the author's reading. A captious critic might say that our contemporary does what he deprecates in the mathematicians whom he pitches into—wears the undergarments of his mind on the outside; but they are nice undergarments and agreeable to look at. This question of what your audience can stand must come up every day with the editor, the author and the preacher, and each must decide for himself, having in mind the calibre and temper of his audience. Some folks, we suppose, like to read about the mechanics of flight; some like to know what a locomotive driving wheel really does under certain specified conditions, and some, we suppose, like to think they are pursuing the knowledge of the unknowable. The burden of our contemporary's complaint is that Mr. Parke undertook by the skillful use of an instrument of which he has rare command, to ascertain and to prove to a club of railroad mechanical men something that many of them want very much to know; that is, exactly what a driving-wheel does. Mr. Parke could have guessed and fudged, but so could his audience, and so they have for years, and at the end of the evening they would have come out at the same hole at which they went in. When the Purdue tests were published many doubted if a locomotive wheel really rises clear of the track and remains so any important part of its revolution. Mr. Parke therefore took up an original theoretical investigation and showed essentially what the compressed wire from the Purdue tests had shown; that at certain speeds often attained, with certain conditions of counterbalancing, a driving wheel does actually rise clear of the rail, and does remain so for a quarter of its revolution, more or less. There can therefore no longer be any doubt in the minds of men who have read the reports of the physical experiment and have followed Mr. Parke's analysis that such a phenomenon really happens. All this our contemporary fails to appreciate, or at least fails to tell his readers. He deplores, through more than two pages, Mr. Parke's indiscretion in straining an editor's mind beyond the elastic limit, but he cannot spare a paragraph to tell his readers what the Purdue tests and Mr. Parke really proved. Perhaps he thinks that to them a little knowledge would be a dangerous thing, and perhaps he is right. As we have said at the outset, every editor must be his own judge as to what his own audience will stand. While it would be impertinent to question an editor's judgment of the elastic limit of his own readers, it is not inadmissible for us to say that we have a higher opinion of the intellectual capacity of the railroad clubs, and of scientific and technical audiences generally, than our contemporary pretends to have.

The Louisville & Nashville's grievances against its principal competitor have been so far removed that its notice of withdrawal from the Southern Railway & Steamship Association has been abrogated, and with it the similar notices from other roads. The complaint was a very serious one, as appeared from the outlines of Messrs. Smith's and Felton's letters printed in the *Railroad Gazette* last week, but the committee which brought the opposing parties together seems to have been equal to any and every kind of difficulty. Although the Louisville & Nashville apparently had good grounds for some of its accusations, the important fact that it has to deal with stronger competition, and at more places, than it did a few years ago, seems to have been insufficiently appreciated by its officers. The restoration rests chiefly on the consent of the L. & N. to submit to the arbitration of the association certain questions concerning competitive freight which at first it insisted upon deciding for itself (and of course, it insisted upon fighting to maintain such decision). The outcome of the whole matter only again confirms the settled view of Albert Fink and other old experts, that orderly contests within an association are *always* better than open warfare, which is pretty sure to degenerate into guerilla warfare. Heated contests seem to be as necessary, now and then, in freight rate matters as a crisis is to a fever. The great multitude of irregularities in this business, like the mass of physical impurities found in dealing with a fever, can be swept away only by a special concentration of power, and both maladies can best be treated in the hospital, where the largest force of expert doctors can be availed of.

The second conference on the proposition of the Interstate Commerce Commission to prescribe a uniform style for tariffs (especially freight), which was held at Washington last week, seems to have brought out little that was new, though a large number of railroad officers were present, and a better understanding was reached in regard to various details. The Commission aims chiefly to secure business-like methods in the issue of joint tariffs, which are in many cases made and published in a very loose way. A rule will probably be made requiring the name of the responsible officer, for each of the roads interested, to be shown on every joint tariff issued, and requiring each such officer to promptly send to the Commission a formal acknowledgment of approval by his company of every new joint tariff, issued by any other company, naming rates that are applicable to shipments over his line. By proper arrangements such approvals could reach Washington in time to be filed with the tariff to which they referred. Although this plan will add a good deal to the work of tariff makers its reasonableness can not be denied, for one of the very first essentials in every rate dispute is to know what the official rate is, and who is responsible for it. When a traffic officer staves off overcharge claims by asserting that some other road makes the rates without leave, it is no wonder that consignees get mad. They can reasonably assume either that the statement is a lie or that the road is not well managed.

The movement to separate grades in Chicago seems to have reached a definite and important phase. On the 19th the Chicago City Council, by a vote of 37 to 3, passed an ordinance requiring the Lake Shore and the Rock Island to elevate their tracks, the Lake Shore from Sixteenth street to State and Sixty-seventh, and the Rock Island from Seventy-second to Stewart avenue. The distance covered is about 6½ miles, and the two roads run side by side nearly the whole way. The elevation of tracks will be from 4 to 10½ ft., and 39 streets will be depressed. As we understand it, the railroads are to bear all the expense except a portion or perhaps all of the resulting land damages, which will be borne by the city. This ordinance is, we suppose, the result of an agreement between the engineers of the railroads and of the city, and therefore there is a fair chance that it will be carried out without further serious opposision. It has long seemed probable that the separation of grades could only be effected in Chicago by such a plan as will enable individual companies, or small groups of companies, to retain their independent lines into the city, for the interests to be harmonized to bring about one or two grand union terminal systems are so immense and conflicted as to make harmony practically impossible.

A tour to Buluwayo, which is in Matabeleland, some 1,200 or 1,500 miles north of Capetown, is the latest novelty offered by Thomas Cook & Son, the tourist agents. A pamphlet has been issued describing the route and the prospective adventures of those who take the trip. The fare is £375, and the start will be made from London on April 14, returning Sept. 11. The pamphlet contains a map of the route, which consists of 750 miles of railroad to Kimberley, the center of the diamond fields, then a stretch by coach riding, railroad again through the Orange Free State, coach to Fort Tuli, and then wagons for a long distance. The land route ends at Biera, some 400 miles north of Delagoa, whence the return to Cape Town is made by water. A part of the land ride is to be made by carriers. The fare includes "first class accommodations throughout," which means, we suppose, that the ox wagons are better than ordinary ox wagons. That portion of the tour where the wagons have to be abandoned for carriers "lies through a country teeming with big game, unquestionably the finest accessible sporting country in the world." This is between Umtali and Chimoio.

All the lights on Lake Erie were lighted on the 15t inst., vessels having begun running on the 11th and 12th One vessel leaving Port Huron on the morning of the 11th rerched Cleveland on the afternoon of the next day, the earliest trip through the St. Clair and Detroit rivers for many years. Chicago advices place the opening of Lake Michigan and the Straits of Mackinac on the 12th. Since 1854 the straits have opened only once before in March, *i. e.*, in 1878. Seven times in these 40 years they have opened between May 1 and May 6. At Duluth tugs were passing freely through the harbor on the 17th. There was then less than two miles of ice between the canal piers and open water. Freighters are being placed at mills to load with flour in expectation that the passage will be clear in a few days. The earliest previous opening there was on April 20. This early commencement of navigation is rather discouraging to vessel owners, who see a light season's work before them with almost a certainty of low profits throughout the year. As insurance does not commence until April 1, it is doubtful if any freighting of consequence is done before that date.

A curious situation confronts the State Board of Railroad Commissioners of Kansas owing to the abandonment by the Union Pacific of the Leavenworth, Topeka & Southwestern road. This 47 miles of road, from Leavenworth to Meriden Junction, was originally projected to Denver as a competitor to the Atchison and the Union Pacific. These two companies, in order to get it out of the way, bought the stock and guaranteed the interest on the bonds. Its operation has never paid and each company has taken turns in making up the deficiency. When the Union Pacific went into receivers' hands this branch was not put in with the other assets, and it has now been abandoned. The Santa Fe is not at all anxious to claim the property; and the officers say that if the Attorney-General commences suit to forfeit the charter, no attempt will be made to prevent it. As the road runs east and west the projectors of the great north and south line will not want it, and while the citizens of two or three towns located on it are clamoring for transportation facilities, the state officials are said to be in a panic for fear they will be obliged to take charge of it.

As there are 8,000,000 bushels of grain afloat at Chicago and 46,000,000 bushels awaiting shipment at various lake harbors, much interest is felt in an early opening of the Erie Canal. In reply to a letter from Secretary Thurstone, of the Buffalo Merchants' Exchange, asking that the canal might be opened between April 10 and 15, Superintendent of Public Works Hannan said that a contract was awarded a few weeks ago to construct a stone wall three-quarters of a mile in length on the Erie Canal, near Schenectady, and it would be impossible to open the canal before May 1.

NEW PUBLICATIONS.

The Manual of Statistics and Stock Exchange Handbook. New York: Nicoll & Roy Co., 16 Dey street. 1894. Price, $3.

The 16th annual edition of this manual, just published, is brought down to Dec. 31, 1893. It contains, in quite abridged form, descriptive and financial facts about the railroads of the United States and about many miscellaneous companies, industrial, manufacturing, electrical and others. Numerous tables give the highest and lowest prices of stocks and bonds recorded in the last two years on the New York Stock Exchange and at other exchanges, securities listed during 1893 or stricken from the list in the same year, statistics of bank condition, prices of produce in various markets and a good deal of other information.

Journal of the Iron & Steel Institute, 1893; Part 2. Bennett H. Brough, Secretary. London and New York: E. & F. N. Spon. 1894.

This volume contains the minutes of the Darlington meeting, held in September, 1893, E. Windsor Richards, Esq., President. The papers presented at that meeting include one on Basic Steel at Witkowitz; Iron and Steel at Chicago; Modification of Carbon in Iron; Development of the Manufacture of Iron and Steel Wire; Suggested Improvements in the Manufacture of Steel Plates, and various papers on Ores, the Treatment of Coal, and so on. The customary notes on the Progress of the Iron and Steel Industries occupy 260 pages or more and form a valuable part of the volume.

School of Mines Quarterly, January, 1894. Columbia College, New York City. Price, 50 cents.

This issue contains a number of papers which appear to be of only moderate interest to our readers, the longest of which is one on the Mechanical Preparation of Ores in Saxony, Hartz and Rhenish Prussia. This is a continuation of a report begun in a previous number. Other papers are Modern Water Works Construction, by W. C. Foster; A Plant for Granulating Slag, by R. H. Terhune; The Relation of Engineering to Progress and Civilization, by Professor Hutton, etc.

Journal of the New England Water-Works Association, March, 1894. R. C. P. Coggeshall, Secretary, New Bedford, Mass. Price, 75 cents.

This issue of this quarterly journal gives a report of the last quarterly meeting, held in December, and of an adjourned meeting held in January, with a list of those present and the papers presented, with the discussions thereon.

TRADE CATALOGUES.

Open Hearth Steel Castings of the Standard Steel Casting Co., Thurlow, Pa.

This little pamphlet gives illustrations of some of the most remarkable recent castings made by the Standard company, and some description of the product in general. As the company has done considerable work for the United States Government, its steel has necessarily had to stand severe tests. A table of official tests by the government shows tensile strength of different specimens, running from 64,000 up to 79,000 lbs., elastic limit from 36,000 up to 38,500, elongation from 15 to 25 per cent., and reduction of area from 16.3 to 49.7 per cent. The company is prepared to furnish castings up to 70,000 lbs. in weight, and has already produced the largest ever made in the country for United States Government vessels. One of the castings illustrated is a stern shaft bearing for the International Steamship Company's (American line) vessels weighing 67,135 lbs. Specimens from this gave a tensile strength of over 68,000 lbs., elastic limit 35,800, elongation 20 per cent. Another casting, and a very remarkable one, indeed, is a stern post for the cruiser "Columbia," weighing 49,520 lbs. This had a tensile strength of 75,800, elastic limit 35,000, elongation 21.76 per cent. The form is a very difficult one to produce successfully in such an enormous mass.

Catalogues of the Consolidated Car Heating Company, Albany, N. Y.

The scheme of catalogues of this company involves 16 parts made of uniform size and arranged for binding together conveniently. It is an excellent plan and permits of bringing up special parts of the catalogue to date without destroying the whole. A bundle of these catalogues just received includes eight parts, treating of the Sewell Coupler, the McElroy Commingler, the Multiple Circuit Systems, Drum Systems and Baggage Car Equipment, Direct Systems and Fruit Car Heating, Individual Heater for Hot Water Circulation, Locomotive and Tender Equipment, and the Electric Heater and Street Car Heating.

The Davis Automatic Shades and Curtains for Passenger Cars, etc. The Davis Car Shade Co., Portland, Me. A pamphlet of 16 pages gives illustrations and descriptions of many varieties of the Davis shade. The devise for holding the shade, which was described in the *Railroad Gazette* within the last year, is shown in detail with directions for measurement and for ordering.

Mason Regulator Co.—Apparently considering that in periods of financial depression their customers have leisure for innocent diversion, the Mason Regulator Company issue, in lieu of a fresh catalogue, sets of wooden dominoes to occupy the idle moments. They invite their nearest friends, however, to pay 12 cents for them.

The Lansing Wheel Barrow Co., of Lansing, Mich., has issued its catalogue No. 5, illustrating and very completely describing the long list of specialties manufactured by the company.

Train Accidents in the United States in February.

COLLISIONS.

REAR.

8th, on Lehigh Valley, at Sugar Notch, Pa., a freight train descending a steep grade ran into a locomotive which had been stopped on account of the detention of another freight ahead of it, and both engines and 1 caboose were badly wrecked. The wreck took fire from a caboose stove and a brakeman was burned to death.

17th, on Pennsylvania road, at Huntingdon, Pa., a passenger train ran into the rear of a preceding freight, wrecking several loaded cars; the wreck took fire and was considerably damaged thereby.

21st, on Austin & Northwestern, near Bertram, Tex., a mixed train, descending a grade, broke in two, and the rear portion afterward ran into the forward one, wrecking 2 cars. A brakeman was injured.

23d, on Canadian Pacific, near Hartland, Me., a passenger train ran into the rear of a wrecking train, making a bad wreck and injuring 2 employees, one fatally. The wreck took fire from a stove, but the flames were extinguished with snow.

24th, on Union Pacific, Denver & Gulf, at Hill Top, Col., a work train ran into the rear of a preceding freight train, on a steep descending grade, wrecking the caboose. Two trainmen were injured.

26th, on Central of New Jersey, near Allentown, Pa., a passenger train ran into the rear of a preceding coal train which had been unexpectedly stopped. A fireman was injured.

And 15 others on 14 roads, involving 7 passenger and 8 freight and other trains.

BUTTING.

3d, on Illinois Central, near Ruddock, Miss., butting collision between a freight train and a gravel train, injuring 1 fireman and 1 brakeman.

12th, on Wheeling & Lake Erie, near Bellevue, O., butting collision of freight trains, making a very bad wreck. Both engineers, 1 fireman and 1 brakeman were killed. There was a blinding snowstorm at the time. One of the trains was running as the second section of a passenger train.

13th, 8 a. m., on New York, New Haven & Hartford, near New Haven, Conn., butting collision between a freight train and a snow plow. Two trainmen were injured.

16th, 4 a. m., on Chicago & Eastern Illinois, at Otter Creek Junction, Ind., butting collision of freight trains, damaging both engines and several cars. Two trainmen were injured.

17th, on Fort Worth & Rio Grande, near Tolar, Tex., butting collision between a passenger train and a freight, doing considerable damage. The passenger conductor was injured.

17th, on Richmond & Danville, near Proffit, Va., butting collision between a freight and a work train, badly damaging both engines and several cars. The engineer was fatally injured. It is said that the flagman of the work train did not go out far enough.

17th, Chicago, Rock Island & Pacific, near Valley Junction, Ia., butting collision between a freight train and an empty engine, badly damaging both engines and 10 cars. Four trainmen were injured, 1 fatally.

And 1 other, of 2 freight trains.

CROSSINGS AND MISCELLANEOUS.

3d, on Eastern Ohio, at Cumberland, O., a passenger train being run upon a side track by a flying switch collided with great force with some cars standing on the side track. A passenger was fatally injured and the conductor less severly hurt.

9th, on Baltimore & Ohio, at Whiting, Ind., passenger train No. 4 ran over a misplaced switch and into a freight train standing on a branch track, damaging the engine and several cars. Engineer and fireman injured.

10th, 2 a. m., on Texas & Pacific, at Rosa, La., a westbound passenger train, which should have entered the side track to meet an eastbound passenger train, ran beyond the switch and started to back in, but was run into by the other train. The engineer of the westbound train was killed.

23d, on Huntingdon & Broad Top Mountain road, near Huntingdon, Pa., a freight train was run into by some loaded cars which had escaped from a siding, and a brakeman was killed and the conductor and another brakeman injured.

25th, on Seaboard Air Line, near Auburn, Ga., a freight train ascending a grade broke in two, and one car ran back some distance to the foot of a grade and stopped. Soon after this another car broke away from the front portion of the train and ran back into the hind car, making a bad wreck. A brakeman was badly injured.

And 3 others, involving 2 passenger and 4 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

19th, on Chicago & Northwestern, near Wolsey, S. D., a passenger train was derailed by a broken rail, badly damaging the cars. Four trainmen were injured.

22d, on Colorado Midland, near Newcastle, Col., a passenger train was derailed and the locomotive overturned, at a defective switch, and the fireman injured.

27th, on Illinois Central, near Durant, Miss., 2 cars in a passenger train were derailed by a broken rail and fell down a bank. Eleven passengers were injured.

And 8 others, on 7 roads, involving 2 passenger and 6 freight and other trains.

DEFECTS OF EQUIPMENT.

6th, on New York, Susquehanna & Western, at Middletown, N. Y., a freight train was derailed by a broken wheel, and parts of several coal cars fell through a bridge on the tracks of the Erie Railroad below. The bridge was badly damaged.

23d, on Columbus, Hocking Valley & Toledo, near Upper Sandusky, O., a freight train was derailed by a broken axle and six cars were ditched. Three tramps were injured.

28th, on Baltimore & Ohio, at Cook's Mills, Pa., a freight train was derailed by the breaking of a flange and ten cars of cattle were badly damaged. A drover was injured.

And 6 others on 4 roads, involving 1 passenger train and 5 freight and other trains.

NEGLIGENCE IN OPERATING.

11th, on Atlantic & Pacific, at Allentown, Ariz., a freight train, running rapidly, was derailed by a misplaced switch, and the engine and 5 cars of fruit were ditched; 3 trainmen injured.

And 2 others, involving 1 passenger train and 1 freight.

UNFORESEEN OBSTRUCTIONS.

8th, on Missouri, Kansas & Texas, near Houston, Tex., passenger train No. 3 ran off the track at a point where a rail had been maliciously removed, and the mail car and baggage car were overturned and fell into White Oak Bayou. The baggageman, mail clerk and express messenger were injured. The rear brakeman, who went out with a flag, was shot, presumably by the train wreckers in ambush, and was badly injured. The baggage car took fire from the overturned stove, but the fire was extinguished by water, which the bystanders brought in their hats, from the creek.

12th, on Central of Georgia, near Georgetown, Ga., passenger train No. 9, running slowly, was derailed at a washout and the engine was overturned. The fireman was injured.

13th, on Philadelphia, Reading & New England, at Boston Corners, N. Y., a passenger car at the rear of a freight train was overturned by a high wind. The train was running on a curve at the time.

14th, on Chicago & Alton, near Carlinville, Ill., a freight train drawn by two engines was derailed by running over a cow, and both engines and 10 cars of live stock were derailed and badly damaged. The fireman was injured.

16th, 1 a. m., on Southern Pacific, at Roscoe, Cal., a passenger train was derailed by a misplaced switch and the engine and two fruit cars were ditched. Robbers immediately attacked the train, and it appears that they must have misplaced the switch. They tore a hole in the express car by the use of dynamite and fired several shots at the trainmen. The fireman and a man stealing a ride were killed by these shots and the engineer and 1 brakeman were injured in the derailment.

22d, on Southern California, near Los Angeles, Cal., the engine of a passenger train was derailed by a sand drift. The engineman was slightly injured.

And 10 others on 10 roads, involving 7 passenger and 3 freight and other trains.

UNEXPLAINED.

1st, on St. Louis Southwestern, near Rusk, Tex., the caboose of a freight train was derailed and overturned and several cars were wrecked with it. A brakeman was injured.

15th, on New Orleans & Northwestern, at Gilbert, La., a freight train was derailed, doing considerable damage. A woman near by, standing in her own doorway, was so frightened by the wreck that she dropped dead, probably from heart disease.

23d, on Cleveland, Lorain & Wheeling, at Martin's Ferry, O., a car in a freight train was derailed and overturned and 2 trainmen were killed.

And 24 others on 19 roads, involving 3 passenger and 21 freight and other trains.

OTHER ACCIDENTS.

12th, on Atchison, Topeka & Santa Fe, at Temple, Tex., the engine of a switching freight train was wrecked by the explosion of its boiler. The engineer was killed and 2 other trainmen were injured, 1 of them fatally.

28th, on Baltimore & Ohio, at Nuzum's Mills, W. Va., the engine of a freight train was wrecked by the explosion of its boiler; 3 employees injured.

And 1 other, involving 1 freight train.

A summary will be found on another page.

Recent Developments in Rapid Transit in Chicago.

The Lake Street Elevated Railroad was formally turned over to the owners on March 9, by Underwood & Green, the contractors, six miles of road having been completed and equipped. The contracts under way and not yet completed are also turned over to the company. One of the most important of these is the Northwest Extension, four miles in length as at present projected, running from some point on the main line west of Ashland avenue in the direction of Humboldt Park and probably beyond. It is said to be the intention of the company to complete this branch as soon as possible.

There now seems a possibility that a downtown structure may be built on Lake street and Wabash avenue which will accommodate both the "Alley" and the Lake street roads. Considerable opposition was manifested when the plan was first proposed, especially among Wabash avenue property-owners. A canvass recently made among the tenants along the avenue revealed the fact that a large number of them are in favor of some plan which will bring the patrons of the Lake street road to their doors. Lake street merchants are also said to favor an extension of the "Alley" to their locality, believing that the advantages to be gained will compensate them for the drawbacks which will necessarily accompany the presence of the structure. The canvass among the merchants of Wabash avenue has been made by a committee appointed by the property-owners, and not on behalf of either road. As these extensions are something the roads have been trying for months to effect, it may be taken for granted that there will be little hesitation on their part if offered a right of way.

The Englewood and Stockyards extensions of the "Alley" have not yet been located, though the extensions seem to be desired both by the management of the road and by the inhabitants of the localities to be reached. The road does not, however, care to go to the expense of condemning a right of way, while, on the other hand, the property-owners object to having the line touch their property.

The Metropolitan Elevated Company has completed the erection of its structure from Jefferson street to West Forty-eighth street, with the exception of a gap of about half a mile east of Ashland avenue. Construction on this section has been delayed by litigation over car barn property of the street railroad company. It is not expected that the line will be operated before July or August. No contracts have yet been let for the branch lines. The details of the design of the bascule bridge over the river have not been fully developed in all particulars.

The proposed route of the Northwestern Elevated Railroad has been filed with the Commissioner of Public Works, but has not been approved. The line is expected to start at the west end of Wabash avenue between Monroe and Madison streets and extend west along the alley until it reaches the alley between La Salle street and Fifth avenue, where it turns north and runs straight across the river to the alley north of Michigan street, where it turns west. At the alley between Market and Franklin streets it turns north and runs almost directly north as far as the alley south of North avenue, upon which it runs west to Town Court and north to North avenue, which will be the terminus for the present.

The promoters of the various downtown elevated loops are threatened with competition in the shape of subway lines from no less than four different corporations or private parties, some of whom, at least, are fully capable of properly estimating the difficulties to be encountered in such an undertaking.

Chicago Main Drainage Matters.

Work on Section E of the drainage canal has been seriously interrupted by an overflow from the Des Plaines River during recent high water. At this point is one of the first diversions of the river; and between the present channel of the river and the proposed route of the canal is a levee, which ordinarily is of sufficient height to guard against any overflow from the river. Before the right of way was secured, the section was partly occupied by a large ice pond and icehouses owned by Swift & Co. Owing to the neglect of the contractors to raise the levee to a safe height, the river flooded the section and filled the ice pond to a depth of several feet, washed out a dam near the icehouses, and overflowed the land surrounding the icehouses. The only outlet for the water was a sluice, which was soon washed out together with a part of the embankment, and filling the old Illinois and Michigan Canal which at this point is several feet below the Des Plaines River. The volume of water poured into the canal was such as to set up a current both toward Joliet and Chicago. The break

was finally repaired without much damage except to the contractors, who will be obliged to pump a large amount of water out of their section before their work can proceed.

It is estimated that the spillway on the river diversion near Riverside took care of about 60,000 cu. ft. of water per minute while the flood was at its highest. It was estimated that the river in its present condition was capable of handling about 400,000 cu. ft. of water per minute, and the spillway was put in to carry the excess over that amount back to the Chicago River and into the lake, instead of flooding Joliet and other towns along the river, where the channel is at present not large enough to carry a greater amount of water. It is proposed to raise the spillway, after enlarging the channel of the river at such points, and it is believed that it can be enlarged sufficiently to carry all flood waters without making use of the spillway at all. The commissioners in charge of the work express themselves as well satisfied with the state of affairs, and claim that the high water which did some damage at Joliet was from the old canal, and due entirely to the break in the levee at Section E, for which the contractors alone are said to be responsible.

An agreement has been made with the Santa Fe road to have the bridge across the river below the spillway raised to a safe height, as the recent floods have shown a danger of sweeping the structure away at high water. The bond will in future require a space between the spoil bank and the excavation of at least 200 ft. A landslide on Section 5, caused by dumping the spoil on the bank 50 ft. away, brought about the recommendation.

The budget of expenses of the Main Drainage Canal for the month of February shows a total expenditure of $300,200, distributed as follows:

Engineering department	$12,813
Clerical department	950
Law department	5,610
Treasurer	166
General account	2,938
Engineering department (construction account)	244,451
Law department (land account)	30,011
Police department	3,257
Total	$300,200

Railroad Matters in Chicago.

Freight Traffic.—There are substantial reasons for thinking that the general aggregate handled by the leading lines compares well with a year ago. The merchandise shipments of the higher classes showed a good increase over any previous week the current year, and the only descriptions on which there was a shrinkage from the third week in March, 1893, were coal and other low grade freight, which pays the smallest charges for hauling. The inward grain traffic here, while not up to that of the preceding week, was much larger than anticipated either by railroad managers or the grain trade, the footings of all descriptions being 3,277,000 bushels compared with 2,366,000 the corresponding week last year. Other produce made an equally good showing, while live stock freight was largely in excess. There was also a surprising gain in that class of traffic over the week immediately preceding. General Manager Merrill said: "There is evidence that there will be an average volume to move from the country as the season advances, and we hope to make a fair show of net earnings. Our charges for repairs of track, bridges and rolling stock the past four months have been unusually low because of the small number of snow blockades and washouts by floods. The majority of the other lines have been equally fortunate in that respect. If business justifies we shall relay an average amount of track with new rails, and make other repairs wherever needed." General Manager Earling said: "Our general traffic is improving, but the chief gain in traffic so far is along our main divisions which traverse the most densely populated sections. The indications now are that our earnings the coming four or five months will not show much decrease from the same time last year." An official of the Northwestern said: "The improvement in freight traffic which commenced with the opening of the current month continues to show a gradual increase; even our small wheat business in the Northwest is fairly compensated by a good movement of coarse grain in other sections, and traffic along our main lines is really better than we anticipated, as there is a fair revival of trade and industry at about all points." General Manager St. John said: "Our business shows a fair gain on most divisions since the close of February. There has, however, been considerable irregularity in the character of the freight handled, the most satisfactory improvement being in Westward merchandise and other package freight." The Illinois Central, Chicago & Alton and Wabash report a fair increase in general business both to and from the interior, but they all complain that despite the improvement they are handling less profitable freight than a year ago. The Atchison, Topeka & Sante Fe makes a rather slim showing on business from the country, but reports a good increase in about all classes of outward freight. The officials also report a material increase in business west of the Missouri, especially on their main lines. The Chicago & Eastern Illinois continues to suffer from the effects of stagnation in the coal trade, coupled with labor troubles at the mines; but the local traffic along the entire line has been improving. The gain, however, is not sufficient to compensate for the shrinkage on coal freight, which is its chief reliance. The "Monon" officials report a fair business south, with an enlarged local traffic, and state that although they are confronted with a decreased freight traffic in some directions compared with last year, they are enabled by close economy to make a fair comparison of net earnings. They also state that the revival of building operations here will largely increase their stone traffic from Indiana quarries that in prosperous times is a large item of freight, but it has been practically nothing the past 12 months.

The following shows the deliveries of grain (bushels) at Chicago by the leading Western railroads for the week ending March 17, and comparisons with the two preceding years:

	1894.	1893.	1892.
C. & N. W.	892,000	285,000	397,000
Ill. Cent.	311,000	268,000	397,000
C., R. I. & P.	359,000	42,000	357,000
C., B. & Q.	721,000	757,000	591,000
C. & Alton	15,000	11,000	103,000
C. & E. Ill.	20,060	80,000	57,000
C., M. & St. P.	571,000	324,000	476,000
Wabash	170,000	33,000	19,000
C. & G. W.	138,000	219,000	146,000
A., T. & S. Fe	79,000	347,000	218,000
L., N. A. & C.	1,000		
Totals	3,277,000	2,366,000	2,761,000

The deliveries of flour (barrels) at Chicago by the leading Western railroads for the week ending March 17 and the corresponding time the two preceding years compare as follows:

	1894.	1893.	1892.
C. & N. W.	17,728	43,826	31,715
Ill. Cent.	750	750	1,925
C., R. I. & P.	2,450	1,500	2,375
C., B. & Q.	5,810	17,581	9,193
C. & Alton	750	1,843	3,600
C. & E. Ill.	600	300	
C., M. & St. P.	22,625	41,300	26,925
Wabash	750	1,200	500
C. & G. W.	32,943	9,452	18,686
A., T. & S. Fe		900	
L., N. A. & C.			
Totals	84,406	118,652	94,922

Passenger Traffic.—The railroads centering here from the interior report a fair increase in passenger business over the preceeding week. The gains on both through and local business over the Burlington, Chicago, Rock Island & Pacific, were decidely marked, while a fair increase was secured by the Illinois Central, Chicago & Alton; Chicago, Milwaukee & St. Paul; Chicago & Northwestern, and Atchison, Topeka & Santa Fe. The last two roads also reported a good through business to California. The Northwestern in this business has an advantage in its relations with the Union Pacific, which owing to the low rates made have enabled it to attract a patronage which would have been divided with other lines had full traffic rates been enforced. The recent action of the Union Pacific on both California and other Western passenger business has engendered a feeling of bitterness against it among all the leading Western lines centering here except the Alton & Northwestern, which will, when an opportunity offers, bring retaliation.

Track.—Managers expect to lay an average mileage of new rail. They decline, however, to state the extent of their orders already placed for rails and other materials; but the fact that the Illinois Steel Company started all its rail mills at South Chicago to-day, and that the Secretary of the company states that they have already booked orders for about 70,000 tons of rails, is proof that some of the large lines have placed good orders. The manager of one of the most prominent Western lines said: "We expect to take up a good many light rails on our main line and replace them with 80-lb. rails." Orders for bridge material to replace wooden structures are small, and it is said that no work of that kind will be undertaken that can possibly be avoided until the character of the coming crops is shown to be satisfactory.

CHICAGO, March 19.

TECHNICAL.

Manufacturing and Business.

The Westinghouse Air Brake Co. has declared a quarterly dividend of 5 per cent.

The National Rolling Mill Co., of McKeesport, has received enough orders to enable it to keep its plant in steady operation.

The Keystone Bridge Works of the Carnegie Steel Co. are being operated on full time with a slightly reduced force of men.

The Montreal office of the Dominion Bridge Company Ltd., has been removed from 20 St. Alexis street to 511 Board of Trade Building.

The Hasell Perfected Railway Signal Co., of Jersey City, N. J., with a capital stock of $100,000, has been incorporated by T. J. Oakley, T. I. Morris, Bentley D. Hasell and George Smith.

The following officers were elected at the annual meeting of the directors of the Berry & Orton Co., of Philadelphia: President, L. H. Berry; Vice-President, B. B. Wolff; General Manager, H. C. Baker; and Secretary and Treasurer, H. W. Thorn.

Riehle Bros. Testing Machine Co., of Philadelphia, has appointed Mr. Carroll B. Smith, 32 Builders' Exchange, Buffalo, N. Y., its selling agent for Buffalo and vicinity for the Riehle testing machines and testing appliances, and other machines and tools handled by the firm.

The 100 cars being built by the Mount Vernon Car Co. for the Mobile & Ohio are to be "Carson & Gurganus ventilated refrigerator cars." Equipment of the same type is already in use on the Mobile & Ohio. The cars will be of 60,000 lbs. capacity, and will have the Garson & Gurganus patent door.

The Beamless Brake Co., of Bloomsburg, Pa., has just received an order from the New York, Susquehanna & Western for 50 beamless brakes, to be applied to the new coal cars recently ordered for the road. The New York, Susquehanna & Western has had the brake on trial over a year, and has lately put it on several cabooses. The above is a portion of the order for 200 cars placed with the Bloomsburg Car Co.

New Stations and Shops.

The Pittsburgh Locomotive & Car Works, of Allegheny, are erecting a new carpenter and repair shop to replace an old structure.

The new union depot in St. Louis is to be formally dedicated July 4, the twentieth anniversary of the dedication of the Eads Bridge.

W. B. Wilson, of Buffalo, has the contract for the erection of a number of buildings, which will double the capacity of the shops of the National Car-Wheel Works at Depew, near Buffalo.

The Boston & Maine station at Lynn, Mass., is now being removed, as well as a number of adjoining houses, and as soon as this work is finished the erection of the new station which, it is estimated, will cost about $250,000, will be commenced.

The Chicago, Burlington & Quincy has recently purchased property at Fifth and Choctaw streets, in Leavenworth, Kan., for a new passenger station, and it is understood that the company has arranged to have the new building erected by July 1.

Iron and Steel.

The Kansas City Steel & Iron Works, of Kansas City, was chartered last week by F. B. Johnson, J. R. Cline, S. H. Springer, J. R. Marsh and J. F. Houlehan.

All the departments at the Pennsylvania Steel Works at Steelton, Pa., were started this week for the first time in three months, with over 4,000 men at work.

The Bethlehem Iron Co. has orders which will keep its steel mill running day and night for some weeks. The mill has not run more than a fortnight at any time for more than a year. It employs 1,500 hands.

The time for assenting to the plan of reorganization for Cofrode & Saylor, incorporated, and the Reading Rolling Mill Company, which have been in the hands of receivers for about a year past, expired last week, and it is reported that a large majority of the creditors have assented.

The Illinois Steel Co., whose works at South Chicago has been idle since early in September last, has resumed work at that plant. The company has orders for sufficient rails to keep the plant running for at least 60 days. The company will also begin rolling steel billets at its South Chicago mills. This is a new departure, as heretofore it has only produced billets at its Joliet mills. Four blast furnaces will also be started. In all 2,000 men will be given employment.

Electricity for the Erie Canal.

It is reported that the General Electric Company has contracted to supply the Cataract Electric Company of New York with $100,000 worth of machinery to furnish the electric power by which it is proposed to propel boats on the Erie Canal.

Passenger Cableways.

The proposed passenger cableway projected for Wheeling, W. Va., is not entirely a novel means of ferrying, for Knoxville, Tennessee has what is called an "aerial bridge" that has been in operation for some time. This cableway consists of two 1¼-in. wire cables, which span 1,060 ft., anchored on the bluffs on either side, which are 350 ft. and 230 ft. high above the water. The grade of the cable is about 33 per cent. The cables combined have a breaking strength of 120 tons. The car is 20 ft. long by 6 ft. wide and 6½ ft. high, and weighs, empty, 1,200 lbs. It has a seating capacity of 16 passengers. Automatic brakes are provided, which will stop the car if the propelling cable should break or run slack. It requires about one-half minute to make the trip down and three and one-half minutes to return. The fare is 5 cents.

Chicago Dock and Harbor Matters.

Complaints have been lodged against the Harbor-master at Chicago by vesselmen, who assert that the letting of dock privileges has been greatly abused, and charge him with having allowed the river to be blockaded, and imperiling vessels in transit by permitting boats to lie all winter almost in the middle of the stream and in such a way as to almost close the draw at the bridges; also by discrimination against the vessel interests and traffic in dock privileges.

The dredging companies of Chicago are said to be perfecting an organization which will enable them to more successfully compete with the government engineers. They assert that the government authorities are in the habit of providing specifications in asking for bids with which contractors cannot comply, and so secure the necessary authority to build dredging machinery for government work. This results in loss of work to the

local contractors, and they believe that unless some stand is taken to prevent it they will eventually be forced out of business, as the greater part of the work of that nature is said to be under government control.

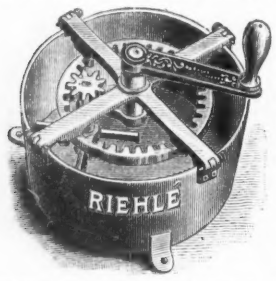
The Calumet & Chicago Canal & Dock Company manages to make a satisfactory showing, notwithstanding the depression in the real-estate market during the past year. Sales of property amounting to $143,754 were made during the year ending Jan. 31, 1894, of which amount $118,130 was received from acre property and $25,623 on lots. The sales of lots show a profit of 27 per cent., and those of acres a profit of 33 per cent. over inventory figures. The notable improvement of the year is the new elevator being built by the South Chicago Elevator Co., to be completed by April 1. It adjoins one built last year by the same company and is to have a capacity of 1,500,000 bushels. Though sales of property have been light during the past six months, the company looks for a renewal of inquiry for dock and acre property during the coming summer.

A Lake Steamer.

The Detroit Dry Dock Company launched last week a new steel steamer, the Harvey H. Brown, at its yards at Wyandotte. This boat has a length over all of 262 ft. and a 40-ft. beam, and has a rated capacity of 4,000 net tons with present depths of water. It is sheeted with 7-in. oak plank to the bilge line. The engines are triple expansion with cylinder diameters of 22, 23 and 36 in. and a stroke of 44 in. The boilers are 14 ft. in diameter and 12 ft. long. The cost, completed, will be about $220,000.

Riehle Cement Mixing Machine.

The illustration shows an apparatus for mixing cement. It consists of a substantial bowl of cast brass, fitted with cross arms, easily removable, which furnish a bearing for a center crank shaft. The hand crank when turned, rotates a short crank in the bowl. This crank carries a paddle which circles in the material in the bowl, and a pinion on top of the paddle shaft engages with a fixed annular gear, which causes the paddle to rotate on its axis. The combined motions cause the paddle mixer to traverse every part of the bowl. This mixer is constructed of brass, except the hand crank, which is japanned. When ready to empty the bowl, all the working parts can be removed by drawing a couple of pins.



In all testing laboratories an appliance of this kind will be found very convenient to mix batches of cement in a uniform manner.

The dimensions of the machine are: Diameter of bowl, 10 in.; depth of bowl, 5 in.; extreme height, 11½ in.; length of handle, 6-in. crank. It is manufactured by Riehle Brothers' Testing Machine Co., Philadelphia.

THE SCRAP HEAP.

Notes.

A freight train on the Grand Rapids & Indiana was captured by tramps near Wayland, Mich., one night last week and the conductor and the few passengers on the train were terrorized. Fourteen tramps were afterward arrested. A gang of 30 tramps took possession of a freight train on the Southern Pacific, in Texas, but they were afterward arrested.

Judge Caldwell, of St. Louis, has directed the Receivers of the Atchison, Topeka & Santa Fe to transfer from the Travelers Insurance Co. to the Union Casualty Co., of St. Louis, the privilege of doing accident insurance business among the employees of the road, with the privilege of collecting premiums through the Treasurer of the railroad company.

The Chicago, Milwaukee & St. Paul, which keeps trains apart by a space interval, throughout its lines has recently put in new signals and apparatus on the line between Chicago and Council Bluffs, so that the whole length of that line is now provided with special block signals. The Delaware & Hudson contemplates the establishment of the block system on the line between Albany and Saratoga, N. Y.

Some of the rooms in the new portion of the Broad Street Station of the Pennsylvania Railroad, at Philadelphia, were opened for use this week, including the ladies' waiting-room, 41 ft. × 81 ft., which will be temporarily used as a general waiting-room. A number of offices in the upper stories will be occupied about April 1. The new trainshed has been in use for some time and it is said that all trains are now moved with great punctuality.

The Agricultural Department has issued a circular to be sent to all railroad presidents in the United States offering suggestions for co-operation in the movement for inproving wagon roads. It is suggested that whenever a general road improvement is undertaken the railroads carry materials at cost. The method of computing the cost could be defined, and a board constituted for adjusting the rates to be granted, in accordance with local conditions. "Such a concession would be of great value to the public, and its bare announcement would do more to advance the road movement than years of purely educational work."

The Mobile & Ohio has issued a circular to its trainmen, engineers, conductors, firemen and switchmen, stating that in accordance with the promise made last November, the wages which were then reduced 8 per cent. have been restored from March 1, but that a reduction may be again necessary next month. The Chicago, Burlington & Quincy has laid off a large number of freight train men. It is announced in Boston that the Boston & Albany is discharging many men and reducing expenses in every way possible. The President of the New York, New Haven & Hartford is reported as saying that the regular quarterly dividend recently declared by his company was not earned.

A widespread storm did much damage to railroads in Idaho and Montana last week. On the 14th a reservoir broke near Boise, Idaho, and a large tract was submerged. It was reported that every bridge on the Union Pacific, between Nampa and Bisuka, a distance of about 35 miles, was washed out. Two miles of track and several bridges were washed away on the Northern Pacific at Miles City, Mont. At Holbrook, Or., an immense landslide has occurred, over which a trestle is being built. A press dispatch from Seattle, Wash., on March 15 reported the arrival of a passenger train from the East a week behind time. Many snowplows had been disabled, so that a severe snowstorm blocked the road badly.

Senator Smith, of New Jersey, has introduced in Congress a bill for an amendment of the Interstate Commerce law. It provides that a common carrier which violates the act may be prosecuted for misdemeanor and upon conviction shall be subject to a fine of $5,000. Representative Boatner, of Louisiana, has introduced in Congress a resolution to investigate the management of the Union Pacific and to sue the present and past directors or their heirs to collect $35,000,000, which it is alleged they have wasted in the management of the road instead of using it to pay the debt to the Government as they ought to have done. The Railroad Committee of the Massachusetts Legislature is giving hearings to the advocates of a bill to require a guard rail on the roofs of all freight cars. The New York Legislature has before it a bill to require the Manhattan Elevated of New York City to carry passengers through, over the Suburban road, operated by the Manhattan, and the east side lines of the Manhattan proper, for a single five-cent fare. The combined length of these two lines is only about the same as that of the west side line of the Manhattan. Canada does not mean to be behind the procession in legislation to "benefit the people," and a bill has been offered in the Dominion Parliament to fix the rate of passenger fares on all railroads at two cents a mile. The region of the most pernicious activity still tends to hover over Ohio, where the Senate Committee on Railroads and Telegraphs has reported favorably the bill imposing upon sleeping cars an annual fee of $50 each, which has been under consideration several weeks. It contains a clause requiring upper berths to be kept locked so long as a single lower berth is unoccupied, and that all sleeping cars be provided with a ladder for each upper berth. The reporter naïvely adds that "The bill was drawn up by Representative John Strehli, the patentee of a sleeping car ladder."

South American Notes.

During the year 1893 there were entered at the port of Rosario, Argentine, 365 foreign steamships with 537,406 tons register, and 304 sailing vessels with 168,597 tons register.

The Argentine Government has appointed a commission, with Senor Juan L. Somoza as chief, to superintend the canalization of the Rio Yaguaron, for which work $50,000 has been appropriated.

The Brazilian Government has approved the plans for the construction of the railroad from Canboto to Corrientes in the State of Pernambuco, as well as the first section of the line from Uberaka to Coxima.

The Chilian Government has authorized the construction of the following new lines of railroad: A narrow gage from Antofagasta to Aguas Blancas, with branches to the nitrate works of that district; a prolongation of the Tongoy line from Cerrillos to Trapiche; a line from Rancagua to Peumo; and an electric tramway from Santiago to San Bernardo.

It has been suggested to set out plantations of the *Pinus pineaster* in the arid regions of Argentine along the lines of railroads which are subject to obstruction by sand drifts, as a means of protection from this evil. This pine is adapted to barren sandy soils, and is furthermore of economic value on account of the large amount of turpentine which it yields.

It is to be regretted that the Chilian Congress has closed its session without taking action on the bill which provided for an increase in the guarantee on the Trans Andine Railroad bonds from four per cent. to five per cent. The contractors confidently assert that the money could be obtained on the larger interest, and this failure on the part of Congress, due apparently to obstructionist tactics by a small minority, will seriously retard the completion of one of the most important railroads in South America. It is claimed that the nine and a half miles of tunnels yet to be bored, which work will take the larger part of the money which the promoters of this enterprise are trying to raise, could be reduced to less than three miles by a change of location, but the functions of the greater length of these tunnels will be to serve as permanent snowsheds, so that without them the line would be subject to obstruction during a part of the year, unless ordinary snowsheds were constructed, and these would again increase the cost, and would be liable to destruction by avalanches. It is said that the bill for an increase guaranty will be brought forward at the next session of Congress.

Amenities in Texas.

W. L. McBride, the popular conductor, who is credited with having the finest furnished caboose on the Southern Pacific system, was with us all day yesterday. He has quite a nice collection of fine birds in his car, principally of the songster tribe. Mc is quite an ornithologist as well as an able conductor.—*Glidden (Tex.) correspondent Fort Worth Gazette.*

Antwerp International Exposition.

Mr. T. A. Matthews, of the United States Honorary Commission, announces that this Exposition will open promptly on May 5, the main buildings being now completed. American exhibitors should apply for space before April 1 at the New York headquarters, 14 Church street. This fair will afford exceptional opportunities for exhibiting goods to buyers, not only from all the countries of Continental Europe but from Latin-America and Australia. Exhibits should be ready for shipment by April 10 and special low transportation rates will be granted.

A Ruling on Illinois Train Service.

The citizens of several towns along the Belleville & Eldorado division of the St. Louis, Alton & Terre Haute filed a complaint with the Railroad and Warehouse Commission of Illinois some time ago alleging inadequate train service on that division of the road. The Commissioners have investigated the case and have issued an order directing the railroad company to put on a passenger train as asked for. The Commission found that the earnings of the road, less operating expenses, amounted last year to $2,776 a mile on its entire system of 239 miles, and that its earnings have been on a like scale for several years past. It is held that the earnings of the entire system must be taken into consideration and that it is not a sufficient answer to the petition for better train service to say that the particular line in question is not profitable.

Union Station at Denver Burned.

The Union passenger station at Denver, Col., was destroyed by fire on the night of March 17, the loss being $300,000. The flames were discovered at 12:30 a. m. in the baggage department, in the south end of the building. The fire burned fiercely, and in spite of all efforts it gained headway very fast. At 1 o'clock it reached the central portion of the building, and in a few moments the tower was in flames and portions of it began to fall. This caused the northern portion to take fire. The building was 800 ft. long and was built about 12 years ago. It was built of stone.

Iron Ore Freights.

It is asserted that 2,000,000 tons of Bessemer ore from the Mesaba range are offered on dock at Cleveland, by J. D. Rockefeller, at $2 50 per ton. If this is the hatching from the "mare's nest" discovered by the New York *Tribune* last fall, when, on learning of the formation of the syndicate, it asserted that the Mesaba syndicate intended to market a large tonnage of its ore by means of an exorbitant price, that paper owes the public an explanation. To meet the figures quoted above, Mr. Rockefeller estimates rail freight at 40 cents and lake freight at 65 cents, and calculates on a profit of 50 cents a ton. As he controls the railroad between the mines and the ore docks, and owns a majority of the stock of the Whaleback Company, it is probable that he can secure freighting at the figures mentioned above. This low price is made to meet a contract by the Norrie mine, of the Gogebic range, which has sold ore at Cleveland for $2.75. Mines producing hard ores or those paying royalties will probably be left out of the market during the continuance of such prices.

LOCOMOTIVE BUILDING.

The New York, Susquehanna & Western has given an order to the Rogers Locomotive Works for one passenger locomotive and two Mogul and one consolidation freight engines. These locomotives will be built to burn culm. The delivery is to be made by June.

CAR BUILDING.

The Metropolitan Elevated road of Chicago has placed an order with the Pullman company for 100 passenger cars.

The Armour Refrigerator Co. has placed an order with the Wells & French Co., of Chicago, for 50 refrigerator cars. These are in addition to the 200 cars ordered in January.

The Haskell & Barker Car Works are reported to have secured a contract for 1,500 cars, and the plant at Michigan City, Ind., will resume operations after six months of idleness.

The Swartzschild & Sulsberger Packing Co. has ordered 50 refrigerator cars from the Missouri Car & Foundry Co. The cars are to be completed and delivered in Kansas City by May 1.

The shops of the Pennsylvania at Columbus, O., have recently completed an order for passenger day cars for the Cincinnati & Muskingum Valley, to replace the old passenger equipment of that road.

The shops of the Southern Pacific at Sacramento, Cal., are now building 150 refrigerator fruit cars. Oregon pine is to be used for the construction of the cars, and the work will be done by the piecework system.

The Mexico Cuernavaca & Pacific road of Mexico is having four passenger cars built by the Jackson & Sharp Co., at Wilmington, Del. The company will soon place an order for fifty freight cars and two large ten-wheel freight locomotives.

BRIDGE BUILDING.

Baltimore, Md.—Delegate C. H. Carter, of Baltimore has introduced in the Maryland Legislature a bill to grant a charter to the Curtis Bridge Co. for a bridge over Curtis Creek. This bill is intended to revive an old charter for the building of this bridge.

Baltimore & Ohio Southwestern.—The Keystone Bridge Co., of Pittsburgh, has secured the contract for building 33 new iron bridges on the line of this road this year. Thirty of the bridges are to be erected on the Mississippi Division, and the other three on the Ohio Division.

Brockville, Ont.—C. J. Pusey, of Irondale, Ont., General Manager of the Irondale, Bancroft & Ottawa Railroad, has submitted the plans for the proposed bridge across the St. Lawrence River from Brockville, Ont., to Morristown, N. Y., to the War Department at

Washington, and they are now being examined by the United States engineers of the Champlain and St. Lawrence districts. It is claimed that work on the substructure of the bridge will begin in May. The plans are for a cantilever bridge over 5,000 ft. long, with two channel spans of 750 ft. on the American and Canadian sides of the Three Sister Islands in the St. Lawrence River.

Columbus, O.—Bids for the construction of the Front street viaduct in this city were as follows: Edgemoor Bridge Works (two plans), $51,700 and $54,000; Detroit Bridge Works (two plans), $51,760 and $52,984. The contract was awarded to the Edgemoor company on its $54,000 plan.

Dunbar, Pa.—The grand jury has approved the report of viewers in favor of a county bridge over Dunbar Creek at this place.

Farmington, Me.—The long trestle bridge at Farmington, Me., is to be repaired and strengthened the coming summer.

Hamilton, O.—A bill has been introduced in the Ohio Legislature permitting the construction of two bridges in this city over the Great Miami River at High and Main streets if they can be erected at a cost of $100,000. Originally it was the intention to build only one bridge to cost the above amount.

Houston, Tex.—The King Bridge Co., of Cleveland, has the contract for a steel bridge across White Oak Bayou on Crockett street near the Southern Pacific crossing. The bridge is to have one steel span of 100 ft. The contract price is $6,500, and the bridge is to be finished by June 1.

Kansas City, Mo.—The contract has been awarded to the Detroit Bridge & Iron Co., of Detroit, for the superstructure of the Blue River Bridge for the Belt Railway at Kansas City, Mo. The bridge is to be 150 ft. span, double track, pin connected, of medium steel, weight about 450,000 lbs. The masonry piers, 35 ft. high, of Liberal sandstone, have just been completed by Charles Linder, contractor, of Kansas City.

Lisbon, Me.—Residents of the town of Lisbon, Me., are agitating the building of an iron bridge across the Androscoggin at that place.

Little Falls, Minn.—The city of Little Falls has closed a contract with the Pine Tree Lumber Co, of that city, for the construction of a three-span combination wagon bridge across the Mississippi River at Little Falls.

The committee appointed by the City Council to investigate the proposiion made by the Pine Tree Lumber Co. to build a bridge across the Mississippi River in the northern portion of the city has reported favorably.

Lockport, N. Y.—A bill has been introduced in the New York Legislature to authorize the erection of a lift bridge over the Erie Canal at Adam street, the city of Lockport to pay $5,000 and the state $10,000 for the bridge.

Massillon, O.—The Canton Bridge Co. has enjoined the two other bridge companies here from proceeding with the construction of several county bridges on the ground of alleged irregularities in the contract letting. One of these bridges is across the Tuscarawas River at Main street.

Milton, Pa.—Bids have been submitted by 30 firms for the construction of the river bridge at this point.

New York City.—Judson Lawson, of New York City, has introduced in the New York Assemby a bill to incorporate the Interstate Hudson River Bridge Co., to build a bridge across the Hudson River north of 170th street. The bill provides for a pier in the river, the bridge to be 160 ft. high. John Graham Hyatt, C. H. Worman, and George G. McWaters, are named as the incorporators. The newspaper reports assert that the Pennsylvania Railroad is interested in the scheme, but what foundation there may be for this statement does not appear.

The Senate of the New York Legislature has passed the bill authorizing the City of New York to build a bridge over the Harlem River at One Hundred and Twenty-fifth street and First Avenue at an expense of $2,000,000. The bridge is to be completed within eight years from the passage of the act, and be not less than 60 ft. wide, the grade at an elevation of not less than 24 ft. above mean high water.

The Board for the Park avenue improvement opened bids on March 8 for building a timber trestle between 106th and 115th streets, and for building temporary trusses and trestle bents between 114th street and the Harlem River. The principal quantities included in the first specifications were: Timber, 1,380,000 ft. B. M., and iron work, 105,000 lbs. There were 12 bidders with prices ranging from $41,350 (Mairs & Lewis, New York) to $73,900. The quantities included in the second specification were: Timber, 697,000 ft. B. M.; iron work, 719,000 lbs. There were 11 bidders with prices ranging from $50,240 (Colin McLean) to $80,000.

Pittsburgh, Pa.—The Committee on Rivers and Harbors of the Chamber of Commerce is urging the erecof a bridge over the Monongahela River at South Twenty-second street, and two draws in bridges at Dams No. 1 and 2 on the Muskingum River.

Turner, Me.—The county of Androscoggin, Me., is building a new first-class steel bridge across the Androscoggin at Turner.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

A Texas statute provides that if any railroad shall not, within two years after its articles of association shall be filed and recorded, begin the construction of its road, and construct, equip, and put in good running order at least 10 miles of track, it shall forfeit its corporate existence, and its powers shall cease, so far as relates to that portion of said road then unfinished, and shall be incapable of resumption by any subsequent act. The Court of Appeals holds that while this article is self-executing, and the failure to comply therewith forfeits the charter without any judicial decree declaring the forfeiture, yet such forfeiture relates only to the unfinished portion of the road, and not to any property previously acquired, or to the completed part of the road. Also that on the forfeiture of the charter of a railroad company because of its failure to construct, equip, etc., its property rights survive for the benefit of those who may have right to, or just claim on its assets.[1]

In Maryland the Court of Appeals holds that under a statute authorizing two railroad companies, whose tracks form a continuous line, to consolidate on such terms as may be agreed upon, the consolidated company is liable for the death of a servant of an original company, where such company was liable therefor before the consolidation.[2]

In Tennessee a railroad company entered into an agreement with a city to lay its track in and through a portion of said city, and agreed to permit any other railroad terminating in the city to use the track, paying a *pro rata* share of the cost. The Supreme Court rules that under the agreement all railroads which have a terminus in said city, without regard to whether they are operating under foreign or domestic charters, are entitled to use the tracks.[3]

In Missouri the Supreme Court rules that a railroad charter by providing for relinquishment of the right of way by the "owner," impliedly makes it unnecessary for the wife to join in the conveyance by reason of her inchoate right of dower, and it makes no difference that the husband does not convey directly to the railroad, but by mesne conveyances.[4]

In Iowa, it is held by the Supreme Court that an order of the railroad commissioners that defendant railroad company transfer cars delivered to it by another company, from its station to another point, as a switching service and at switching rates, will not be enforced where such point is beyond the yard limits, and the service rendered is on the main line, and is done under orders, as in case of trains, and not under the direction of the yard master.[5]

In Mississippi a statute authorized the N., J. & C. R. Co. to sell absolutely all or any of its railroad and other property, "together with all franchises, rights, powers, privileges and immunities." Section 2 authorized the same company and the L., N. O. & T. Ry. Co. to consolidate, under the name of the latter, on such terms as they might agree to. The Supreme Court rules that the consolidated company is entitled to all the privileges of the N., J. & C. R. Co., including its exemption from taxation.[6]

The Court of Appeals of Texas holds that money deposited in a bank by a receiver is money on hand, and not a debt against the bank, and is liable to taxation.[7]

A Missouri statute requires every railroad to furnish an annual statement of the length of its road and trackage in the State, with depots, water tanks and turntables, as well as the number of cars and engines, and makes it the duty of the State Board to assess and equalize the valuation of such property. A section requires all property, including lands and buildings, owned by a railroad company, and not previously specified, to be assessed by the proper assessors in the several counties and cities. The Supreme Court holds that property purchased by a railroad company for future yard purposes, in the possession of the company's tenants, and used by them for manufacturing, with the right reserved to the tenants to remove their buildings at the expiration of the lease, falls within the section and is assessable as local property.[8]

In Minnesota the Supreme Court holds that a railroad organized for and doing the business of an ordinary railroad, transporting passengers and freight, is subject to taxation only in accordance with the statute by the rule of percentage on its gross earnings, though the road is only three miles in extent, and the cars are operated by a steam locomotive over two miles of the road, and by cable up a steep ascent of one mile.[9]

Injuries to Passengers, Employes and Strangers.

In Iowa the Supreme Court rules that it is not negligence for a passenger to leave the train by the rear platform, and that where the rear platform of a car is not a safe place for passengers to alight, failure on the part of the carrier to warn passengers of that fact is negligence, though it was safe to alight at the front platform.[10]

In Alabama it is ruled by the Supreme Court that it is negligence for a railroad to furnish the Station Master and the conductor similar uniforms, and to give them similar signals, with different meanings.[11]

In South Carolina the Supreme Court holds that a railroad is liable to one who, while approching its depot for the purpose of taking a train, is injured on a trestle used as an approach to the depot, unless it exercised extraordinary care to keep such trestle in safe condition.[12]

In Georgia it is held not *per se* negligence for a person with an umbrella in one hand and a handkerchief in the other to attempt to board an electric street car while it is in the act of stopping to receive passengers, and before it has come to a full stop.[13]

In New York cars free from defects were loaded with lumber in the usual manner, and hauled more than 100 miles. They were also inspected at certain points. Afterward, just as a train was passing on an adjoining track, a piece of timber, placed crosswise on one of the cars, worked loose and was forced into the caboose, injuring a brakeman therein. The Supreme Court decided this not such an accident as could have been anticipated, and which therefore could be charged to the railroad.[14]

In the same state and court it appeared that a coal train had taken the side track to allow a passenger train to pass. The switchman, being suddenly seized with a mistaken belief that the switch was set wrong, impulsively threw the switch, diverting the passenger train to the side track, and killing the engineer. The switchman was 17 years old, and had been instructed as to his duties, and fully understood them. The Court holds that the evidence was insufficient to show that the company was negligent in employing the switchman.[15]

In the Supreme Court of the United States it is held that an engineer in charge of a locomotive which is running detached from any train, cannot be regarded as in control of a department of the company's business, so as to render him a vice principal in his relation to the fireman of the locomotive; but the two are fellow servants, although the company's rules declare that under such circumstances the engineer shall also be regarded as a conductor. Two judges, Chief Justice Fuller and Mr. Justice Field, dissent from this conclusion.[16]

In Indiana the Supreme Court rules that though there were snow and ice on the cars from which certain rails were to be unloaded, the danger of the work in unloading them cannot be said to be so apparent as to charge plaintiff with contributory negligence in obeying orders to unload them.[17]

The Supreme Court of the United States lays it down that in determining the liability of a master to his servant for injuries caused by the negligence of another servant, the question does not turn merely on the matter of subordination and control, but rather on the character of the alleged negligent act. If that act is done in the discharge of some positive duty of the master to the servant, then negligence in the act is the negligence of the master, irrespective of the gradations of service as between the servants themselves. If the act is not one in the discharge of such positive duty, then there should be some personal wrong on the part of the master before he can be held liable.[18]

In Missouri the Supreme Court holds that a master is not liable to his servant for injuries alleged to have been caused by defective appliances, where such appliances are reasonably safe, if prudently used, though better ones could be obtained.[19]

In New York it is ruled that whether the failure of a railroad to keep blocked a frog in which a brakeman's foot was caught while attempting to uncouple a car is negligence is a question for the jury.[20]

In Georgia a declaration of a section hand against a railroad company alleged that while plaintiff and others, under a foreman, were on a hand car going around a curve, they saw, 90 ft. ahead of them, an extra or "wild" engine coming towards them, and that while attempting to remove the hand car from the track, under the order of the foreman, plaintiff was struck by the engine and injured; that plaintiff had not been notified that there was an extra engine on the track, and that the injury was caused without his negligence. The Supreme Court holds that the declaration stated a cause of action.[21]

In Georgia it is held by the Supreme Court that where a railroad negligently injures one of its employee's, and has him treated by its surgeon, a payment made by the company to the surgeon, even at the employee's request, is no consideration for a release by the employer for all damages caused by the injury, since the company is liable for expenses of treatment which the injury caused.[22]

The Supreme Court of Indiana holds that a person approaching a railroad crossing has a right to presume that the servants of the railroad will apprise him of an approaching train by giving the statutory signals.[23]

In New York a teamster, on approaching a railroad crossing, found the gates down. After a train had passed, the gate tender raised the gates, signaling him to cross. The view was obstructed, and the grade to the crossing descending. The Supreme Court holds that the teamster was not necessarily negligent in proceeding on a trot, or in failing to act with the best judgment on suddenly finding himself in great danger from an approaching train.[24]

In Kentucky it appeared that plaintiff, while using the track as a footpath, heard a train approaching from behind, and stepped off to let it pass. After it had passed he stepped on the track, without looking back, and was struck by the rear section of the train, that had broken loose. There was no evidence of negligence causing the break. There was evidence that there were two brakemen on the detached cars, trying to stop them by setting brakes, and that they did not see plaintiff. Plaintiff had used the tracks for a footpath for three years without objection. The Court of Appeals reles that the company was not liable.[25]

In Mississippi, the Supreme Court holds that an engineer is not willfully negligent in failing to stop, while there is yet time, to examine an object which he supposes to be a dog, or something inanimate, lying on the track, but which, on closer approach, is discerned to be a child, if he could not have stooped after such discovery.[26]

[1] S. S. Ry. v. St. L., A. & T., 22, S. W. Rep., 107.
[2] State v. B. & L. R. Co., 26 Atl. Rep., 865.
[3] L. & N. v. Mississippi & T. Ry. Co., 22 S. W. Rep., 920.
[4] Chouteau v. M. P. Ry. Co., 22 S W. Rep., 457.
[5] State v. C., M. & St. P. Ry. Co., 55 N. W. Rep., 331.
[6] Nat., J. & R. Co. v. Lambert, 13 South. Rep., 33.
[7] Campbell v. Riviere, 22 S. W. Rep., 993.
[8] State v. St. L. & S. F. Ry. Co., 22 S. W. Rep., 910.
[9] State v. District Court, 55 N. W. Rep., 816.
[10] McDonald v. Ill. Cent. R. Co., 55 N. W. Rep., 102.
[11] K. C., M. & B. R. Co. v. Sanders, 13 South. Rep., 57.
[12] Johns v. C., C. & A. R. Co., 17 S. E. Rep., 698.
[13] White v. A. C. St. R. Co., 17 S. E. Rep., 672.
[14] Knox v. N. Y., L. E. & W. R. Co., 23 N. Y. S., 198.
[15] Burke v. S. B. & N. Y. R. Co., 23 N. Y. S., 458.
[16] Baltimore & O. R. Co. v. Baugh, 13 S. Ct., 914.
[17] Cin., H. & I. Ry. Co. v. Madden, 34 N. E. Rep., 227.
[18] B. & O. R. Co. v. Baugh, 13 S. Ct., 914.
[19] Friel v. Citizens' Ry. Co., 22 S. W. Rep., 498.
[20] Meek v. N. Y. Cent. & H. R., 23 N. Y. S., 420
[21] East T., V. & G. Ry. Co. v. Bridges, 17 S. E. Rep., 645.
[22] R. & D. R. Co. v. Walker, 17 S. E. Rep., 604.
[23] E. & T. H. R. Co. v. Mayhon, 34 N. E. Rep., 27.
[24] Bond v. N. Y. Cent. & H. R., 23 N. Y. S., 450.
[25] L. & N. R. Co. v. Schmetzer, 23 S. W. Rep., 603.
[26] L., N. O. & T. R. Co. v. Williams, 12 South. Rep., 957.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Freehold & Jamesburg Agricultural, 2 per cent., payable April 2.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlantic & Northwest, special, Montreal, Quebec, March 27. To authorize the issue of bonds for the construction of the road, and to approve of the lease to the Canadian Pacific.

Canadian Pacific, annual, Montreal, Quebec, April 4.

Chesapeake, Ohio & Southwestern, annual, Memphis, Tenn., April 2.

Chicago & Alton, annual, Chicago, Ill., April 2.

Chicago & Grand Trunk, annual, Chicago, April 11.

Grand River Valley, Jackson, Mich., April 25.

Joliet & Chicago, annual, Chicago, Ill., April 2.

New York Central & Hudson River, annual, Albany, N. Y., April 18.

New York & Rockaway Beach, annual, New York City, March 27.

Panama, annual, New York City, April 2.

Pennsylvania, annual, for election of directors, Philadelphia, Pa., March 27.

Pittsburg, Cincinnati, Chicago & St. Louis, annual, Pittsburgh, Pa., April 10.

Sterling Mountain, annual, New York City, April 3.

Toledo, Ann Arbor & North Michigan, annual, Toledo, O., April 18.

Union Pacific, annual, Boston, Mass., April 25.

West Virginia Central (Alex. Boudron, President), annual, 1727 North Tenth street, Philadelphia, Pa., March 29 at 4 p. m.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Master Car Builders' Association* will hold its annual convention at Saratoga, N. Y., beginning June 12. The hotel headquarters will be at Congress Hall, H. S. Clements, Manager.

The *Master Mechanics' Association* will hold its annual convention at Saratoga, N. Y., beginning June 18.

The *Association Air Brake Men* will hold its first annual meeting at Columbus, O., April 10.

The *American Railway Association* will hold its spring meeting in the Hotel Brunswick, Fifth avenue and Twenty-sixth street, New York City, on April 11.

The *National Association of Local Freight Agents* will hold its annual convention at Pittsburgh, Pa., June 12, 13, 14. The headquarters will be at the Monongahela House.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October. The next meeting will be on Wednesday, March 28.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November. The next meeting will be on Thursday, April 19, at 10 a. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month at 8 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday at 8 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month at 8 p. m.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 51 Lakeside Building, Chicago.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas Place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 7:30 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo, on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday in each month at 8 p. m.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month.

The *Scandinavian Engineering Society of Chicago* meets in room 309, Title and Trust Building, 100 Washington street, on the third Thursday in each month.

The *Foundrymen's Association* meets at the Manufacturers' Club, Philadelphia, Pa., on the first Wednesday in each month.

Northwest Railroad Club.

The Northwest Railroad Club met at the Ryan Hotel on March 14, and discussed the paper presented by S. L. Bean, Master Mechanic of the Northern Pacific, on "Brick Arches in Locomotive Fireboxes." Among those present were: G. D. Brooke, George Dickson, J. C. Barber, George W. Buck, William McIntosh, S. L. Bean, T. A. Fogue, C. A. Seley, D. Willard, P. McCallum, J. F. Goodman, John Hill, F. B. Farmer, W. C. Dallas, G. L. Warren.

E. A. Williams, Master Mechanic of the "Soo Line," was unable to be present, and his paper on "The Care of Passenger Trains at Terminals" will be presented at the April meeting.

Engineers and Architects Club of Louisville.

The next regular meeting of the club will be held on Thursday, April 12. A paper will be read by Mr. J. B. Atkinson, Vice-President of the St. Bernard Coal Co., on "Western Kentucky Coal and Its Preparation for Market."

The Southern and Southwestern Railway Club.

The next meeting of the club will be held at the Kimball House, Atlanta, Ga., on Thursday, April 19, at 10 a. m. The subjects for discussion will be:

(1) "Construction of Ends of Box Cars; the cause of and remedy for the bulging out of ends of box cars;" Messrs. E. M. Roberts, A. G. Steinbrenner and J. M. Holt, committee.

(2) "Is the Collar or Collarless Axle best adapted to general Rolling Stock service?" Messrs. P. H. Schrieber, W. H. Thomas, A. B. Corinth and W. H. H. Price, committee.

(3) "The relative strength of different patterns of metallic and composite and wooden brake beams under service strains;" Messrs. F. H. McGee, Geo. D. Harris and J. T. Robinson, committee.

American Institute of Electrical Engineers.

A meeting of the Institute was held at 12 West Thirty-first street, New York City, on March 21, at 8 p. m. A paper was presented by Prof. Wm. A. Anthony, of Vineland, N. J., Past President, "On the Effect of Heavy Gases in the Chamber of an Incandescent Lamp," and the discussion opened by Prof. W. Lispenard Robb, of Hartford, Conn.

For the convenience of Western members, and in accordance with recent action taken by the Institute, a meeting of members residing in Chicago and vicinity was held on the same date and hour at the Armour Institute, corner Thirty-third street and Armour avenue, Chicago. Prof. D. C. Jackson, of Madison, Wis., was invited to present the paper of Professor Anthony at Chicago, and Prof. B. F. Thomas, of Columbus, O., to open the discussion.

New England Railroad Club.

A meeting was held Wednesday evening, March 14, President Chamberlain in the chair; 72 new members were added to the list. The total membership is now 275. The Treasurer reported a cash balance of nearly $1,500 on hand. The officers elected were:

President, John T. Chamberlain, M. C. B. Boston & Maine. *Vice-President*, L. M. Butler, M. M. New York, New Haven & Hartford. *Secretary and Treasurer*, Francis M. Curtis. *Executive Committee:* F. D. Adams, M. C. B. Boston & Albany; J. W. Marden, Supt. Car Department, Fitchburg; L. M. Butler; John Medway, Sup. M. P. Fitchburg; James N. Lauder, Supt. M. P. New York, New Haven & Hartford; F. M. Twombly, M. M. New York, New Haven & Hartford; George Richards; O. Stewart. *Finance Committee:* George B. Swett, Swett Car Wheel & Foundry Company; A. G. Barber, Valentine & Company; Daniel S Page, Page Bros. & Company; Charles Richardson, Charles Richardson & Company; John Kent, A. French Spring Company and Pittsburgh Forge & Iron Company; F. E. Barnard, B. M. Jones & Company; Isaac N. Keith, Keith Manufacturing Company; George H. Wightman, The Carnegie Steel Company, Limited.

The paper for this meeting was "Some Incidents of Life in Mexico," by Mr. Fred M. Twombly, an interesting popular account of life and character in that country. The President announced that the subject for the April meeting will be "Railroad Switching and Yards," by Mr. Turner, formerly Chief Engineer of the Fitchburg.

Master Car-Builders' Association.

The Committee on Wheel and Flange Gages have issued a circular of inquiry in which the following questions are asked: 1st. Is the present wheel and flange gage, as adopted by the Master Car-Builders' Association, satisfactory?

2d. If not, what changes would you recommend?

3d. Has the Road Department on the road with which you are connected made any objections to the present gage?

Replies should be addressed to Mr. J. N. Barr, Chairman, Supt. M. P., C. M. & St. P. R'y, Milwaukee, Wis.

Freight Claim Association.

The annual meeting of this Association was held in Louisville, Ky., March 15. Car seals were discussed at length, and 150 samples were introduced. An effort was made to have a certain seal adopted as the standard, but the committee recommended that no seal be adopted to the exclusion of others. A committee was appointed to report at the next meeting on a better method of tracing lost cars. The following officers were elected: President, Jno. T. Denniston, Auditor of the Union Line; first Vice-President, C. S. Sutton, Auditor of the Atchison, Topeka & Santa Fe; second Vice-President, J. L. Graham, Claim Agent of the Central of Georgia; Secretary-Treasurer, S. A. Mehorter, Freight Auditor of the Pennsylvania Railroad. The convention will next meet at Old Point Comfort, Aug. 8.

The Civil Engineers' Club of Cleveland.

A meeting was held at the Chamber of Commerce rooms on March 13, 41 members and visitors being present. An application for active membership was read from Mr. Jas. W. Morris, General Roadmaster N. Y., L. E. & W. R. R. The annual reports of the Secretary and Treasurer were read. Reports from the Programme Committee were read by Mr. Geo. E. Gifford, Chairman, and by Mr. C. W. Hopkinson on the subject of "Architecture." These reports were referred for publication. A report from the Local Committee on National Public Works was made to the effect that the Committee could at this time do nothing further and asking that it be discharged. The report was accepted and the Committee discharged. A report was received from the Committee on "New Quarters," through Mr. C. W. Wason, to the effect that the needs of the club were being considered in the proposed remodeling of Case Library Building.

Proposed amendments to the constitution in reference to "Canvas of votes for members" and also in reference to the "Method of nominating officers" were presented by Messrs. Jas. Ritchie, Wm. T. Blunt and Frank C. Osborn. These proposed amendments will be discussed at the next meeting. President A. H. Porter read the annual address, entitled "The Engineer and His Work."

The report submitted by the tellers showed the election of the following officers: President, Ambrose Swasey; Vice-President, John N. Richardson; Secretary, F. C. Osborn; Treasurer, C. P. Leland; Librarian, C. H. Benjamin; First Director, C. W. Wason; for Second Director, N. B. Wood and Walter Miller received the same number of votes. Mr. Miller was elected on the second balloting. Henry E. Riggs was elected Corresponding Member, and Isaac Knapp Pierson, Edwin Grant Lane and Chas. F. Mabery were elected active members

Mr. C. P. Leland, Chairman of the Banquet Committee, announced that the banquet would be held on March 21, at the Hollenden Hotel.

A motion that a vote of thanks be extended the retiring officers for their labors and devotion to the interests of the club during the year was unanimously carried.

Engineering Association of the South.

The regular monthly meeting was held at the association headquarters in the Cumberland Publishing House, Nashville, on March 8, Vice-President Smith presiding. Messrs. A. P. Gaines, Cowan, Tenn.; I. O. Walker, Paris, Tenn., and C. P. Perin, Pikeville, Tenn., were elected to membership.

The paper of the evening was read by the Secretary in the absence of the author, Mr. J. J. Ormsbee. It was entitled, "Coal Handling Plant at Pikeville, Tenn.," and the following is a synopsis: Old simple forms of chutes are now being superseded by those in which the coal is thoroughly cleaned and carefully handled. The mine cars are carried to and from the tipple by a self-acting creeper chain. The coal is dumped on a back tipple, avoiding a large amount of breakage usual in the old style tipples. Lump is made over shaking screens with 1½ in. perforations, inclination 1½ in 12. The coal is lowered slowly into cars by a specially designed chute, having had nowhere a direct drop of more than a few inches. Nut and slack are elevated together and separated on shaking screens with ¼ in. perforations, inclination 3¼ in 12. Good results are obtained from corrugating these screens. The uniformly sized slack made by this plant greatly improves the physical properties of coke. The use of perforated metal shaking screens, compared with that of bar screens, increases both the quantity and the quality of salable coal. The capacity of the plant described is 1,000 tons a day, and the cost $4,400. The estimated running expenses are $6 a day. The plant was designed and erected by Mr. Ormsbee, who is Superintendent Sequatchie Valley Coal & Coke Co.

PERSONAL.

—Mr. J. P. O'Brien, formerly Superintent of the Iowa Central, has been appointed General Superintendent, with headquarters at Marshalltown, Ia.

—Mr. Horace Nichols, a banker, of Bridgeport, Conn., died on March 19, aged 82 years. He was Treasurer of the Naugatuck Railroad until that road passed under the control of the New York, New Haven & Hartford.

—Mr. C. L. Kimball, Superintendent of the Newburg, Dutchess & Connecticut Railroad, died at his home in Matteawan, N. Y., last week. Mr. Kimball was Superintendent of the road since 1877, having been Superintendent of the old Dutchess & Columbia since 1871.

—Mr. W. B. Leeds, Superintendent of the Richmond Division of the Pennsylvania Lines has resigned, and will retire on April 1. He has been elected President of the American Tin Plate Co., whose works are at Elwood, Madison County, Ind. Mr. Leeds has been Treasurer of this company.

—Mr. A. J. Ball, who has been Master Mechanic o the Columbus, Shawnee & Hocking, and of the Columbus, Sandusky & Hocking, which succeeded that company, being in charge of the shops at Columbus, O., has resigned, and is now Master Mechanic on the Ohio Southern, with headquarters at Springfield, O.

—Mr. Charles T. Schoen, of Pittsburgh, President of the American Brake Beam Co., has resigned from that office. Mr. W. A. Pungs, of Detroit, who was formerly with the Michigan Railway Supply Co., and who has been General Manager of the consolidated company since it was formed, has also retired.

—Mr. Robert Wright, who has been Treasurer of the Grand Trunk Railroad since 1878, has resigned on account of ill health and has been succeeded by Mr. Charles Percy, the Assistant to the General Manager. Mr. Percy has held that position since 1886 and has also been Treasurer of the Chicago & Grand Trunk since 1879. He was for six years both Secretary and Treasurer of that company. He came to Canada in 1875 as Treasurer of the Great Western Railroad and was afterward Secretary and Treasurer of the Midland and also General Manager in 1878.

—Mr. Samuel J. Potts, who for more than 20 years had been trainmaster of the Philadelphia Division of the Pennsylvania Railroad, died at his home, in Philadelphia, March 15, after a long illness. Mr. Potts was about 57 years of age, and nearly 30 years of his life were spent in the employ of the Pennsylvania Railroad in various positions. During the labor riots of 1877 Mr. Potts was in charge of the station yard at Thirty-second and Market streets, Philadelphia, and he played an important part in dealing with the strikers. For his services then he received special recognition from President Thomas A. Scott.

—Mr. Samuel F. Moore, of Elizabeth, N. J., died in that city on March 17, aged 91 years. Mr. Moore for the last 40 years has been engaged in foundry business at Elizabethport, being the head of the S. L. Moore & Sons Co., owners of the Crescent Iron Works at Elizabethport, and builders of the government ship "Bancroft." Mr. Moore was the first Master Mechanic of the Central of New Jersey, having been in charge of the motive power department of the old Elizabethtown & Somerville Railroad in 1850, when the company owned only three engines, and the shops at Elizabethport were little more than sheds, with not half a dozen tools. He remained with the railroad about 11 years as Master Mechanic, and then with his brothers built a foundry at Elizabeth, which is now continued under the name of the Moore Brothers Co.

—Mr. Allan Campbell, Honorary Member American Society of Civil Engineers, died at his home in New York last Sunday evening, March 18, in his seventy-ninth year, after a life of activity, distinction and public usefulness. He was born in Albany in 1815, of Scotch parentage. His father was also a man of some eminence, having been Deputy Secretary of State and Chairman of the Democratic State Convention. At the age of twenty-one Mr. Campbell was Chief Engineer of the Ithaca & Oswego Railroad and was employed later on the Erie Canal and the Ohio River improvement. In 1850 he went to South America, located and began the construction of the Lima & Callao Railroad, the first railroad in South America. In 1856 he returned to New York and became Chief Engineer and afterward President of the New York & Harlem Railroad, which presidency he held for six years. During the civil war he was engineer on the harbor defenses in the port of New York and afterward was appointed Chief Engineer of Construction of the Pacific Railroad. For nearly twenty years he was at the head of the engineering department of the New York & Harlem road and he was Chairman of the Board of Engineers in charge of the Fourth Avenue improvement, constructing the present viaduct and depressed ways. For some years he was President of the Consolidated Coal Company of Maryland, and Chairman of the Finance Committee of the Board of Directors of the Ohio & Mississippi Railroad. In 1873 he became Commissioner of Public Works of the City of New York, and in 1880 was appointed Comptroller, and he was one of the Board of Trustees of the New York & Brooklyn Bridge. In 1882 he ran as citizens' candidate for Mayor of New York, but was defeated by the

Tammany candidate. He was one of the very few distinguished men ever made Honorary Members of the American Society of Civil Engineers, and was a member of the Century Club, the American Geographical Society and other honorable bodies.

ELECTIONS AND APPOINTMENTS.

Atlanta & Charlotte Air Line.—The annual meeting was held in New York City on March 14, and the following directors were elected: Eugene Kelly, P. P. Dickinson, C. S. Fairchild, B. R. McAlpine, Richard Irwin and R. H. Rochester, of New York; H. W. Sibley, Rochester, N. Y.; Skipwith Wilmer and Michael Jenkins, Baltimore; Joseph Bryan, Richmond, Va; D. J. Garth, Scarsdale, N. Y., and Ebenezer S. Mason, Brooklyn, N. Y. Eugene Kelly was re-elected President, George Sherman Treasurer, and William Wilmer Secretary.

Cincinnati, Hamilton & Dayton.—A. D. Woodford, Henry Shoemaker and Wilberforce Sully were elected directors at the annual meeting held in Cincinnati, O., March 20.

Cleveland, Akron & Columbus.—At the annual meeting held at Columbus, O., March 16, directors were elected as follows: Geo. W. Saul, G. B. Russell and J. H. Hoyt, of Cleveland; R. M. Gilbert, of Columbus; Mills W. Barse, of New York; H. D. Moorehead, of Cincinnati, and Nicholas Monsarrat, of Columbus. Messrs. Barnaby, of New York; Harmon, of Cincinnati, and Morton, of Columbus, O., retire from the directory.

Cleveland, Cincinnati, Chicago & St. Louis.—The office of E. E. Hudson, Master Mechanic of the Cleveland and Indianapolis Division, has been transferred from Cleveland to Bellefontaine, O.

Columbus, Hocking Valley & Toledo.—At the annual meeting held in Columbus, O., March 20, Thomas F. Ryan, James Kilburn and P. W. Huntington were elected directors to serve for three years, and Calvin S. Brice and Walter G. Oakman were elected to serve for one year. The officers elected are: C. C. Waite, Columbus, President; S. D. Davis, New York, and C. B. Alexander, New York, Vice-Presidents; W. N. Colt, Secretary and Treasurer.

Columbus, Sandusky & Hocking.—Geo. F. Gardner, with the Pittsburgh Locomotive Works, has been appointed Master Mechanic of the shops at Columbus, O., vice A. J. Ball, resigned. He was formerly Road Foreman of Engineers for the Ohio & Mississippi and Master Mechanic of the Southern Pacific shops at Fort Worth, Tex.

Grand Trunk.—Charles Percy has been appointed Treasurer of this company, Vice Robert Wright, resigned. Joseph J. Lanning has been appointed Assistant to the General Manager, vice Mr. Percy.

Hanover & Newport.—The incorporators of the company in Pennsylvania are: William F. Hallstead, Geo. M. Halstead, Melvin I. Corbit, James W. Fowler, W. H. Storrs, John F. Snyder, Charles C. Rose and W. O. Wilson, all of Scranton, Pa.

Iowa Central.—J. P. O'Brien has been appointed General Superintendent of this company. The office of the Assistant Superintendent has been abolished. W. H. Voorhies has been appointed Superintendent in charge of Transportation, with headquarters at Marshalltown, Ia.

Kansas City, Fort Scott & Memphis.—The annual meeting was held in Kansas City, Mo., and the following directors were elected: H. H. Hunnewell, Charles Merriam, T. Jefferson Coolidge, B. P. Cheney, John A. Burnham, T. Jefferson Coolidge, Jr., Eugene V. Thayer, L. E. Higgonson, Francis Bartlett, all of Boston; George H. Nettleton, C. W. Blair, B. P. McDonald and O. E. Learnard.

Lehigh Valley.—The office of Master Mechanic at the shops at Weatherley and Delano, Pa., has been abolished. John McGraw, who has been Master Mechanic at Delano since the promotion of John Campbell to the same position at Buffalo, has been made Road Foreman of Engines for the Wyoming Division. Charles H. Dewitt, Master Mechanic at Weatherley, has been appointed Foreman of the shops at that point and at Delano. The jurisdiction of David Clark, Master Mechanic at Hazleton, has been extended to include these shops.

Louisville, Evansville & St. Louis.—The Peoria, Decatur & Evansville, and the Louisville, Evansville & St. Louis, formerly under one management, will be operated separately after April 1, and R. A. Campbell, who has been General Freight and Passenger Agent of both roads, will continue with the latter company, with headquarters at St. Louis.

Mexican National.—W. G. Raoul, J. H. Horsey, Charles C. Beaman, William Mertens, Gustav J. Wetzler, and Stephen S. Palmer, of the United States, and Emilio Velasco and William Landa y Escandon, of Mexico, have been nominated for directors by the first and second mortgage A and B bondholders in New York City.

Missouri Pacific.—The directors have elected George J. Gould President, C. G. Warner Vice-President and General Auditor, W. B. Doddridge General Manager, A. H. Calef Secretary and Treasurer, and Guy Phillips Assistant Secretary.

Peoria & Pekin Union.—The annual meeting was held in Peoria, Ill., March 13. The following are the new members on the board: J. A. Barnard, C. P. Bosworth, of the Jacksonville Southeastern; E. O. Hopkins, of the Peoria, Decatur & Evansville, and George L. Bradbury, of the Lake Erie and Western.

Raleigh & Western.—The following is a recent list of officers of this road in North Carolina: President, Samuel A. Henszey; Vice-President, D. W. Slack; Secretary, K. K. Waite; Chief Engineer, J. S. Morrison. The chief office of the company is at Egypt Depot, Chatham County, N. C.

St. Louis & Hannibal.—The annual meeting was held in Hannibal, Mo., March 13, and the following directors were elected: S. S. Palmer, of New York; J. A. Jordan, of Hannibal; M. T. Cox, of New York; J. C. Thurman, of Hannibal, and J. P. Wood, of New London. The officers elected were: S. S. Palmer, of New York, President; J. A. Jordan, of Hannibal, Vice-President and General Manager; M. T. Cox, of New York, Secretary and Treasurer; J. C. Thurman, of Hannibal, Auditor.

St. Louis, Iron Mountain & Southern.—George J. Gould has been elected President, C. G. Warner Vice-President and General Auditor, W. B. Doddridge General Manager, and A. H. Calef Secretary and Treasurer.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—The second tracking of the 47 miles of line between Emporia and Florence, Kan., is likely to be carried out immediately. The improvement is being urged by Receiver J. C. Wilson. It is argued that with a second track between these points the Atchison would have practically a double track through the wheat belt as far west as Kinsley. From Kansas City to Holliday, 13 miles, there is already a double track. At Holliday the line branches, one going south to Olathe and thence west to Emporia through Ottawa. The other continues east to Topeka through Holliday and thence south, meeting the first at Emporia. At Florence the line branches again, the northern branch passing through the counties of Marion, McPherson Rice, Barton, Pawnee and into Edwards as far as Kinsley, where it merges into the main line. This peculiar location of the road makes the section between Florence and Emporia the busiest on the entire system.

Athens & South Waverly.—This company is a Pennsylvania corporation and was incorporated in that state last week, instead of New York as reported. The line proposed is from Athens, Bradford County, Pa., to South Waverly, Bradford County, a distance of about four miles. The capital stock is $40,000. Charles Kellogg, of Athens, Pa., is President of the road, and all the directors of the company reside in Athens.

Beaver Meadow, Tresckow & New Boston.—Arrangements are reported to have been completed for building this road from Beaver Meadow and Tresckow to New Boston, Pa., 20 miles, and construction is to be gin soon. It will connect with the Delaware, Susquebanna & Schuylkill at Beaver Meadow and with the Pennsylvania Railroad at New Boston. The directors are: A S. Van Wickle, A. M. Eby, C. J. Kirschner, J. F. Barber, W. L. Chamberlain and Philip Weaver, of Hazleton, Pa., and B. W. Wilde, of Milnesville, Pa.

Bellefonte Central.—An effort is now being made to secure the extension of the line from its present terminus at Struble's to Pine Grove Mills, Pa. In order to awaken interest, a public meeting was held at the latter place March 20 at which Ex-Governor Beaver and others spoke.

Brainerd & Northern Minnesota.—The control of this railroad has recently passed from the Northern Mill Co., of Minneapolis, which built the railroad in 1892 to an influential syndicate of lumber dealers of Minneapolis, including Nelson, Tenney & Co., E. W. Bakes & Co., Carpenter Bros. & Co., and several others. These firms have purchased an immense tract of standing pine in Northern Minnesota in the regions between Leech and Cass Lakes and said to contain over 1,500,000,000 ft. of timber. It is understood that the new owners will extend the railroad north to Leach Lake and perhaps also to Cass Lake in order to reach the main body of timber purchased by the syndicate which lies to the west and north of Leach lake.

Canadian Pacific.—The newspaper report, alleged to have been based on an interview with a Canadian railroad contractor, which stated that this company had given the contract to a firm in British Columbia for building 250 miles of new road through the Crow's Nest Pass from Calgary, Alberta, to Nelson, B. C., is denied by Vice-President T. G. Shaughnessy. Mr. Shaughnessy says that the only new construction work which the company is now engaged in is the line north of Mattawa, Ont., to Lake Kippewa. This is the only important construction work decided upon to be carried out this year.

Chicago Central Subrailroad Co.—This company filed articles of incorporation in Illinois last week. The incorporators propose a four-track underground loop road for the downtown district in Chicago, which will make connections with the elevated roads now in operation or to be built hereafter. The chief projector is Marcus Pollasky, who was the projector of the Fresno & Monterey road in California.

Chicago & Southeastern (Ind.).—Superintendent Moore, of Anderson, Ind., placed a force of men on the work near Anderson last week on the extension of this road northeast to Muncie. The line will be about 15 miles long and will connect with the Lake Erie & Western and the "Big Four" road. Superintendent Moore states that the extension will be completed in July.

Chicago, Superior & Pacific.—The charter of this company was filed in Illinois last week by W. R. Chadsey. It is proposed to construct a road from near Chicago, northwesterly, to a point on the Wisconsin state line and via the towns of Wheeling and Diamond Lake, near Richmond, McHenry County, and the village of Genoa, Walworth County, Wis. The company was chartered in Wisconsin in 1892. The projectors claim to possess the title to a partly graded roadbed in Wisconsin.

Clearfield, Conemaugh & Western.—The incorporation of the Clearfield & Conemaugh road was noted last week. Since then the company has been consolidated with the Clearfield Creek road, under the above name. One of the terminal points of the railroad is Johnstown, Pa., and the route is thence northward through Cambria and Clearfield counties a distance of about 75 miles to the mouth of Little Clearfield Creek, where it will connect with the Beech Creek Railroad, and establish communication by means of the Beech Creek and its connections with New York and Philadelphia. It will also connect either by the Beech Creek road or by a branch with the Clearfield & Mahoning Railroad, with the Buffalo, Rochester & Pittsburgh Railroad, thus giving communication with Rochester, Buffalo and points upon the lakes. At Johnstown it will connect with the Baltimore & Ohio road and other roads, and thus reach Pittsburgh and the West. Work is now being done upon that portion of the line which was formerly owned and located by the Clearfield Creek Railroad, and the remainder of the line will be located as speedily as possible, the Chief Engineer and his assistants now being ready to begin the survey. The Chief Engineer is Samuel Brugger. His present post-office address is Fleming, Centre County, Pa. An abundance of coal and timber is reported along the whole of the proposed line, and there will be a good local traffic for the new line as soon as it is constructed. Samuel J. McCarrell, of Harrisburg, Pa., is President.

Columbia & Maryland.—A bill amending the charter of this company is now before the Maryland Legislature. It provides that the corporation shall have the right to construct a railroad from Washington City to Laurel, in Prince George's County, thence to the Pennsylvania line through Prince George's, Montgomery, Howard, Baltimore, Carroll and Frederick counties. The road may be either standard or narrow gage and operated by steam or other motive power.

Florence & Cripple Creek.—The contractors now report that over 12 miles of the track has been laid on this railroad out of Florence, Col. The distance to the Cripple Creek mines to which the railroad is to be built is 40 miles, and the contractors, Orman & Crook, of Pueblo, Col., expect to complete the road to that point by July. President W. E. Johnson, of Florence, also says that the road will be ready for traffic by that date.

Great Northern.—It is announced that the company will at once call for proposals for the construction of a tunnel under the city of Everett, Wash., on the Pacific Coast. It is to be 1,400 ft. in length.

Hanover & Newport.—A charter was issued to this company at Harrisburg, Pa., last week, to build a road commencing at Plymouth Station, Luzerne County, on the Lackawanna & Bloomsburg road, thence extending in a southerly and westerly direction across the Susquehanna River to the village of New Port Centre, in Newport Township, in Luzerne County, with a branch leaving the main stem near Dundee Shaft, in Hanover Township, and extending about two miles southwesterly to Hanover Station, on the Nanticcke branch of the Central Railroad of New Jersey. The length of the road will be 10½ miles. The capital stock is $500,000 and William F. Hallstead, of Scranton, General Manager of the Delaware, Lackawanna & Western, is President.

Jacksonville, St. Augustine & Indian River.—The extension of this road to West Palm Beach, which has been under way since July, 1892, was completed last week, when the last rails were laid neat Fort Pierce at the St. Lucie River, about 60 miles north of Palm Beach, the southern terminus. This extension is 190 miles long, and makes the main line of the railroad 300 miles long from Jacksonville to West Palm Beach on Lake Worth.

Lake Megantic.—This company has applied for a charter to build a railroad from a point on Lake Megantic, Compton County, Que., and running in a southerly direction to the boundary near Dead River. The main office is to be at Sherbrooke, Que.

Mexico, Cuernavaca & Pacific.—J. H. Hampson, President of this company, has returned to the City of Mexico after an absence of several months in the United States. He has closed a contract with Messrs. Cammell & Company, of Sheffield, England, for 2,300 tons of steel rails and fastenings, which should reach Tampico early in April and will be sufficient to complete the road to Kilometre 75, near Huitzilac, on the south side of the mountains and overlooking the Cuernavaca Valley. The grading and masonry work is being finished rapidly. Five large construction camps are located on the line, employing about 1,000 men and 150 teams, and it is expected to have the road built and in operation to Huitzilac by August. Two parties of engineers are in the field, one making a final location from Huitzilac to Cuernavaca, and the other running reconnaissance and preliminary surveys from Cuernavaca through to Acapulco, on the Pacific Coast.

New Roads.—A bill has been introduced in the Maryland legislature authorizing the Mayor and City Council of Manchester, Carroll County, to issue bonds to the extent of $15,000, to be used in constructing a railroad from Manchester to a point on the Baltimore & Harrisburg Railroad, near Maple Grove. At this point the road makes connection with the Western Maryland. The act must be ratified by the citizens of Manchester before it becomes effective.

A hearing was given at the State House at Boston last week to the incorporators of a new railroad company, which is planning to build a new line on Cape Cod, from a point near North Falmouth, along the south shore of the Cape to Hyannisport. The project is said to be so far advanced as to insure the commencement of construction work this spring. The incorporators are Francis W. Parsons, of Osterville, Charles H. Nye, formerly Superintendent of the Cape Cod division of the Old Colony; William N. Kellen, Simeon L. Leonard, of Boston; Frank A. Nye, of North Falmouth; Winslow Warren, of Boston; Joseph C. Stevens and others. The road will be standard gage, connecting with the Old Colony near North Falmouth, extending thence through Hatchville, Wenaumet, East Falmouth, Mashpee and Cotuit, crossing Herring River to Osterville, going within 1½ miles of Wiano Beach, crossing Bumps River, thence to Centerville and Craigville to Hyannisport, connecting again with the Old Colony near Hyannis, on the Hyannis branch of the Cape Cod division. Already a sufficient sum has been pledged to start the work, and further promises have been made of an amount sufficient to complete it in the required time. Over two-thirds of the right of way has been secured.

Northern Pacific.—At a special city election at Ortonville, Minn., on March 13, bonds for $20.000 were voted in aid of the construction of a branch of this company's road from Morris to Ortonville, Minn., a distance of about 30 miles.

Queen Anne's.—A preliminary survey is being made for this company by Richard Silvis between Centreville and Queenstown, Md., on Chesapeake Bay, a distance of 10 miles. This railroad is projected through the western and central sections of Cecil, Kent, Queen Anne's and Talbot counties, in the eastern peninsula of Maryland. W. H. Bosley, of Queenstown, and John B. Brown and others, of Centreville, Md., are the projectors.

Raleigh & Western.—This railroad, which is being built through Chatham County, N. C., mainly by Philadelphia interests, will soon have 15 miles of the line in regular operation. The 10 miles between Colon and Egypt have been operated for over a year, and the next five miles west of Egypt will take the line to Harper's. About two miles of the track beyond Egypt has been put down and the grading is practically finished. J. T. Pruden, of Gulf, N. C., is the contractor for the work now under way. The section of road now about completed has involved some heavy work, but the balance of the projected railroad is through a rolling country. The preliminary surveys are now being made to Ashboro, on the Richmond & Danville. The length of the projected railroad is 95 miles between Ashboro and Smithville, on the Atlantic Coast Line, a station a short distance east of Colon, the present terminus. Samuel A. Henszey is President and Manager, with headquarters at Egypt, Chatham County, N. C.

Southern Pacific.—The coast extension will probably be completed into the town of San Luis Obispo, Cal.,

during April, and it is proposed to run the trains to that point by May 1. The grading is now practically completed to the town limits, but there is an important steel bridge over a stream near the town the material for which has not yet been delivered. The long summit tunnel just north of San Luis Obispo was completed only a few weeks ago. This was the last of the seven tunnels on the 20 miles of the line between Santa Margarita and San Luis Obispo.

Ste. Emmelie.—Application will be made to Parliament at the coming session for a charter giving this company the power to construct and operate a railroad from a point in Gabriel de Brandon, Berthier County, Quebec, to Michel des Saints. The road will pass through St. Damien, Ste. Emmelie, St. Come and St. Zenon. The head office of the company will be at Ste. Emmelie de l'Energie, Que.

Summit-Mineral.—The proposed new railroad in the Rimini mining district, in southwestern Montana, which has been surveyed by Arthur G. Lombard, of Helena, Mont., has been organized under the above name. The railroad will be a narrow gage line, and will be about 20 miles long. Preliminary lines have been run from Rimini southwest to the mines.

Temiscouata.—Mr. Boswell, of Toronto, and S. J. Malcolm, of Three Rivers, Que., the contractors for the construction of the road, have applied for the usual subsidy from the Dominion Government for the last 26 miles of the line, from Edmunston, N. B., to Van Buren Me. The line at the latter point will connect with the new Bangor & Aroostook road.

Toronto Junction.—Application will be made to Parliament at its next session for a charter granting this company the power to build a railroad from Cayugo or Welland, Ontario, on the Canada Southern, extending in a northerly direction and passing through the counties of Welland, Lincoln, Wentworth, Halton, Peel and York, and through Hamilton to Toronto.

York & Schuylkill.—The survey for this line, which is the Pennsylvania portion of the Baltimore Northern project, has been completed this month between Red Lion, near York, Pa., and the Maryland state line near New Park. The road from the Maryland state line to Baltimore is called the Baltimore Northern. Mr. Gilman and John Henry Miller, of Baltimore, are the chief projectors. The entire road will be about 40 miles long, and connects with the Baltimore & Lehigh at Red Lion, its northern terminus, as well as near Baltimore.

GENERAL RAILROAD NEWS.

Chicago, Peoria & St. Louis.—The plan of reorganization of the Chicago, Peoria & St. Louis and the Jacksonville, Louisville & St. Louis, adopted Jan. 8, has been declared operative as to the first-named road. The Reorganization Committee has decided to exclude the securities of the Jacksonville, Louisville & St. Louis from the reorganization. President Hook, of that company, has opposed the plan of reorganization, claiming that the Jacksonville, Louisville & St. Louis should be given more favorable terms.

Chicago, St. Paul, Minneapolis & Omaha.—The annual report for the year ending Dec. 31 gives the following statement of earnings and expenses:

	1893.	1892.	Inc. or dec.
Gross earn	$8,328,928	$9,196,942	D. $868,014
Oper. expen	5,522,331	6,028,417	D. 506,086
Net earn	$2 806,597	$3,168,525	D. $361,928
Fixed charges	1,841,520	1,779,332	I. 62,188
Balance	$965.077	$1,389,193	D. $424,116
Dividends on preferred	787,976	787,976	
Surplus	$177,101	$601,217	D. $424,116

Columbus, Hocking Valley & Toledo.—The Supreme Court in New York has granted the application for a stay of the new trial of the action brought by Congressman J. J. Belden and others against ex-Judge Stevenson Burke and others, for the restitution of over $8,000,000 of the bonds of the Columbus, Hocking Valley & Toledo Railroad, until ex-Judge Burke can present the questions involved to the Court of Appeals.

The following figures are from the annual report for the year ending Dec. 31: Gross earn., $3,280,360; oper. expen., $1,805,735; net earnings, $1,471,625; fixed charges, taxes and rentals, $1,108,637; leaving a surplus of $362,988.

East St. Louis Connecting.—James H. Wilson and E. O. Hopkins, Receivers of the Louisville, Evansville & St. Louis Consolidated, filed a bill in the United States Circuit Court at Springfield, Ill., on March 18 against the above company for the appointment of a receiver and for an accounting. The Receivers of the Louisville, Evansville & St. Louis claim that $50,000 is due them from the East St. Louis Connecting road.

Kentucky Union.—This road, extending from Lexington to Jackson, a distance of 94 miles, and penetrating the coal and timber lands of eastern Kentucky, was sold at Lexington, Ky., March 14, under decree of the United States Circuit Court. The only bid was by J. Kennedy Tod, & Co., of New York, representing the first mortgage bondholders, who offered $1,000,000.

Leavenworth, Topeka & Southwestern.—The Union Pacific Receivers have declined to be any longer responsible for the operating expenses of this railroad; by this action abandoning the operation of the railroad. The line is about 46 miles long, extending from Leavenworth southwest to Meriden Junction, Kan., with 10 intervening stations. The road was opened in 1882, the Union Pacific and the Atchison, Topeka & Santa Fe each owning one-half of the capital stock of the company, which amounts to over $1,100,000. The road has been operated jointly by those companies.

Milwaukee & Northern.—A suit brought by the Chicago, Milwaukee & St. Paul against Alfred M. Hoyt and others, to recover $123,000, the amount of interest due on bonds of the old Milwaukee & Northern road, was decided last week in Milwaukee in favor of the defendants. In the contract by which the Milwaukee & Northern was sold to the St. Paul road it was stipulated that an indebtedness not to exceed $17,000 a mile should be assumed by the purchaser, but no provision was made for the $123,000 interest then due. The purchasing company paid the interest under protest and then sued the former owners for the amount. The Chicago, Milwaukee & St. Paul will probably take the case to the Supreme Court.

Mobile & Girard.—Judge Bruce, of the United States Circuit Court at Montgomery, Ala., has issued a decree for the sale of this road at foreclosure in September next, and this decree, which was issued for March 10, was confirmed by Judge Newman at Columbus, Ga., on March 24, for the Georgia portion of the road. The order was secured by L. F. Garrard, trustee of the first mortgage bonds, which amount to $1,000,000, on which there is an overdue interest of over $100,000. The application of the trustee was opposed by the stockholders of the road. The line is now operated by the Central of Georgia, having been leased to that company in 1886, and extends from Columbus to Troy, Ala., and to Seawright, 123 miles altogether.

Newport News & Mississippi Valley Co.—Judge Wheeler, at New Haven, Conn., on application of Lynde Harrison, a director of the Newport News & Mississippi Valley Railroad, appointed Attorney Edward Zacher, of New Haven, a temporary receiver of the company. The suit was begun at the instance of C. P. Huntington. The Newport News & Mississippi Valley Railroad Company is a security company chartered in Connecticut in 1884, of which Mr. Collis P. Huntington is President and the largest owner. It leased the Chesapeake, Ohio & Southwestern Railroad in 1886, and owned nearly all the capital stock of that company. In November, 1893, Mr. C. P. Huntington sold this stock to the Illinois Central Railroad Company. The full details of this transaction have never been made public. The company also leased the Elizabethtown, Lexington & Big Sandy Railroad in 1886, but the lease of the latter was assigned to the Chesapeake & Ohio Railway Company in 1891.

New York Central & Hudson River.—The company makes the following financial statement for the quarter ending March 31:

	1894	1893	Inc. or dec.
Gross earnings	$10,005,000	$10,706,859	D. $701,859
Oper. expenses	6,572,000	7,325,358	D. 753,358
Net earnings	$3,433,000	$3,381,501	I. $51,499
Fixed charges	2,506,000	2,556,105	D. 50,115
Surplus	$927,000	$825,396	I. $101,614
Dividends	1,162,600	1,117,853	I. 44,747
Deficit	$235,600	$292,468	D. $56,868

For the nine months ending March 31:

Gross earn	$34,045,000	$34,972,740	D. $927,740
Oper. expen	22,890,000	24,041,433	D. 1,151,433
Net earn	$11,155,000	$10,931,306	I. $223,694
Charges	7,720,000	7,520,241	I. 199,759
Surplus	$3,435,000	$3,411,061	I. $23,936
Dividend	3,398,300	3,353,561	I. 44,739
Surplus	$36,700	$57,503	D. $20,803

The company has declared a quarterly dividend of 1¼ per cent., payable April 16.

New York, Lake Erie & Western.—The committee representing the bondholders who are opposed to the plan of reorganization have obtained the opinion of Messrs. Evarts, Choate & Beaman, of New York, in regard to several features of the plan. They are of the opinion that "the Erie company cannot properly apply its earnings, nor can a court properly do so through its receivers, to the payment of any interest on the bonds secured by the proposed new mortgage until the bonds secured by the present mortgage have been paid all interest due thereon." They also raise the point that if the deposited second consolidated mortgage bonds are to be kept alive, then the new mortgage will raise the indebtedness of the company to $103,000,000, which they think it probable that the courts would hold to be in excess of the amount authorized by law.

Sierra Valley & Mohawk.—This road, which was constructed five years ago at a cost of more than $250,000, and which occupies the Beckwith Pass in northern California, was sold at San Francisco, March 10, to satisfy claims of $20,000. The property was purchased for Jacob Goldberg, of San Francisco, for $20,600. The line is 30 miles in length, commencing at Chat, in Lassen County, and extending through the Beckwith Pass, which has an elevation of 5,200 ft. up the sugar timber districts of the Mohawk Valley. From Chat, through the pass and for a distance of 15 miles, rails have been laid, and the line that far is ready for operation. On the second half the grading is all complete and ready to receive the rails. The building of the road was commenced a little over five years ago. The promoters were: A. T. Nation, General Manager; Jacob Goldberg, of Goldberg, Bowen & Lebenbaum, Charles Kohler, of Kohler & Frohling; James T. Boyd, W. J. Callingham and G. M. Nation. A month ago ex-Judge Evans was appointed Receiver by the Superior Court.

Union Pacific.—The following statement gives the results of operations of the company and of the more important divisions:

Month of January:	1894.	1893.	Dec.
Miles operated	6,671	6,671	
Gross earnings	$1,963,749	$2,676,848	$713,099
Oper. expen	1,479.598	1,859,401	379,803
Net earn	$484,151	$817,447	$333,296

Subordinate lines in the system:

OREGON SHORT LINE.

Gross earn	$343,846	$433,151	$89,305
Net earn	102,687	117,245	14,558

OREGON RAILWAY & NAVIGATION.

Gross earn	$226,939	$288,088	$61,118
Net earn	11,440	38,648	27,207

The earnings of the Union Pacific, Denver & Gulf are omitted in both years.

Winona & Southwestern.—Judge Caldwell, of the Federal Court in Minnesota, has ordered that this road be sold on May 1, at Winona, Minn. The decree was made in the case of the Farmers' Loan & Trust Co. of New York.

TRAFFIC.

Traffic Notes.

The first large batch of European immigrants to arrive this season landed March 15. They were ticketed to points in the West and were distributed through the Western Immigrant Clearing-House.

Dispatches from Memphis state that a ruinous passenger rate war is being carried on between the Louisville & Nashville and the Tennessee Midland. The fight was precipitated by the Midland making a $4 rate from Memphis to Nashville.

Chicago Traffic Matters.

CHICAGO, March 21, 1894.

There is little if any improvement in the eastbound situation, either freight or passenger. Reports from the meeting of the Joint Committee held in New York last week state that nothing was done except to pass resolutions to maintain the existing basis of 20 cts. on grain after April 2. The best informed traffic men here have little hope that this basis can be maintained after navigation opens, even if open reductions are not made sooner. The passenger officials seem hopeful that some Moses will be found between now and April 2 to lead them out of the wilderness, and are anxiously searching among the rushes, hoping to find, not an infant, but a full grown deliverer.

Energetic efforts are being made to preserve the westbound immigration clearing house agreement. The greatest difficulty is experienced with the Union Pacific. The other roads accuse it of endeavoring to secure business by excessive commissions, and the Union Pacific people in turn claim that the agent of the western lines is trying to bluff them out. This the agent denies.

The long drawn out arbitration in regard to the fine imposed on the Rock Island for violation of the agreement in selling tickets through an immigrant agency has finally been closed, but just what the status of the matter is no one seems to know. The local association fined the Rock Island $150. Subsequently the association decided that it had no jurisdiction and remitted the fine and the case was taken to the general association. The Alton then claimed that the general association had no jurisdiction. The Chairman ruled otherwise and an appeal was taken to arbitration. The arbitrators have now sustained the appeal.

Western horsemen are complaining because the Official Classification No. 12 increase the rates on horses about one-third by increasing the standard weights from 3,000 lbs. to 4,000 lbs., on ordinary horses and from 4,000 lbs. to 5,000 lbs. on stallions.

The Freight Committee of the Central Traffic Association, at its meeting last week, carefully avoided any reference to demoralized rates, and contented itself with routine matters. Reductions were authorized in iron rates in association territory, and recommendation was made to the Trunk Lines that rates on articles of iron and steel manufacture be made on a basis for 20 cents per 100 lbs. in carloads, and 25 cents l. c. l., Chicago to New York; pig iron and articles taking same rates, 16 cents; billets and articles taking same rate, 17½ cents. It was also recommended that the Classification Committee restore hay and straw to 6th class, minimum 20,000 lbs.

Although the ice is out of the straits and consequently navigation may be said to have opened, vessel owners appear in no hurry to make trips as yet. There are several reasons for this. In the first place, there are no return cargoes in sight. Then the insurance men have not yet announced rates, and are not likely to make low rates this month, as there is no telling what weather may be expected on the lakes. The owners are apprehensive that the railroads are going to make such low rates this year that competion will soon bring rates below a paying basis, especially if the all-rail lines continue cutting rates as they are now doing.

The Minneapolis & St. Louis (Albert Lea Route) is complaining to the Western Passenger Association that the St. Paul-Chicago rate is being cut to $9 by manipulating mileage tickets through brokers' offices and asks an open rate of $9.

Another gain in eastbound tonnage last week over the large gain of the preceding week is taken as indicating that rates are being manipulated. The large fluctuations in the percentages carried by the different roads lends color to this supposition.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines, for the week ending March 17 amounted to 89,616 tons, against 86,955 tons during the preceding week, an increase of 2,661 tons, and against 88,615 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Mar. 17.		W'k to Mch. 10	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	11,687	13.0	8,461	9.7
Wabash	7,075	7.9	10,114	11.6
Lake Shore & Michigan South.	10,002	11.2	14,682	16.8
Pitts., Ft. Wayne & Chicago	11.056	12.4	6,377	7.3
Pitts., Cin., Chicago & St. Louis	7,830	8.7	8,549	9.8
Baltimore & Ohio	8,293	9.3	8,957	10.3
Chicago & Grand Trunk	11,714	13.1	8,999	10.4
New York, Chic. & St. Louis	11,317	12.6	10,339	11.9
Chicago & Erie	7,969	8.8	7,873	9.2
C., C., C. & St. Louis	2,733	3.0	2,604	3.0
Totals	89,616	100.0	86,955	100.0

Of the above shipments 6,548 tons were flour, 56,331 tons grain and millstuff, 8,964 tons cured meats, 9,102 tons dressed beef, 1,355 tons butter, 1,074 tons hides and 3,803 tons lumber. The three Vanderbilt lines carried 37.8 per cent., the two Pennsylvania lines 21.1 per cent.

(*Other Chicago traffic news will be found on page 217*).

Transcontinental Passenger Matters.

President Reinhart, of the Atchison, Topeka & Santa Fe, announces that the Southern Pacific-Atchison war is ended, and that directions have been given to restore rates immediately. The position of the companies has been put back to that prior to March 1, all differences to be taken up for adjustment before May 15.

The Atchison people have been especially bitter in their denunciation of what they term the uncalled for action of the Northwestern-Union Pacific in cutting rates through brokers. The Northwestern people claim that they had no hand in the matter, and explain the cut as caused by the scalp through San Francisco. What makes the other lines suspicious, however, is the fact that the cut rate is to be obtained only on tickets of Union Pacific issue, in connection with local card tickets of the Northwestern to Council Bluffs. They argue that, if the cut was one made by the brokers by using the San Francisco scalp, tickets of the issue of other lines than the Northwestern-Union Pacific could be purchased. There has been some talk of asking the Chairman of the Western Passenger Association to order the suspension of all business with the Union Pacific.

Trouble has broken out again beewten the Canadian Pacific and its competitors in the Northwest. The charge is made by the Northern Pacific that the Canadian Pacific has deliberately broken the agreement recently entered into respecting North Pacific coast rates, by quoting rates via Mackinaw and St. Paul $8 less on first class and $5 less on second class than the agreed rates. The officials of the trunk lines admit that the rates are shown in their rate sheets, but claim that they understood that they were to be applied only via Port Arthur.